OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME 44, NO. 2
JANUARY 17, 1955

AMERICAN

DYESTUFF REPORTER

Devoted to Textile Chemistry
BLEACHING · DYEING · PRINTING · FINISHING

Hard-working colors for playtime clothes!

Summer sun and frequent washings can be really tough on the colors in leisure clothes. But cottons, rayons and linens dyed with Du Pont vat dyes stay bright and fresh as new despite many washings and long exposure to direct sunlight.

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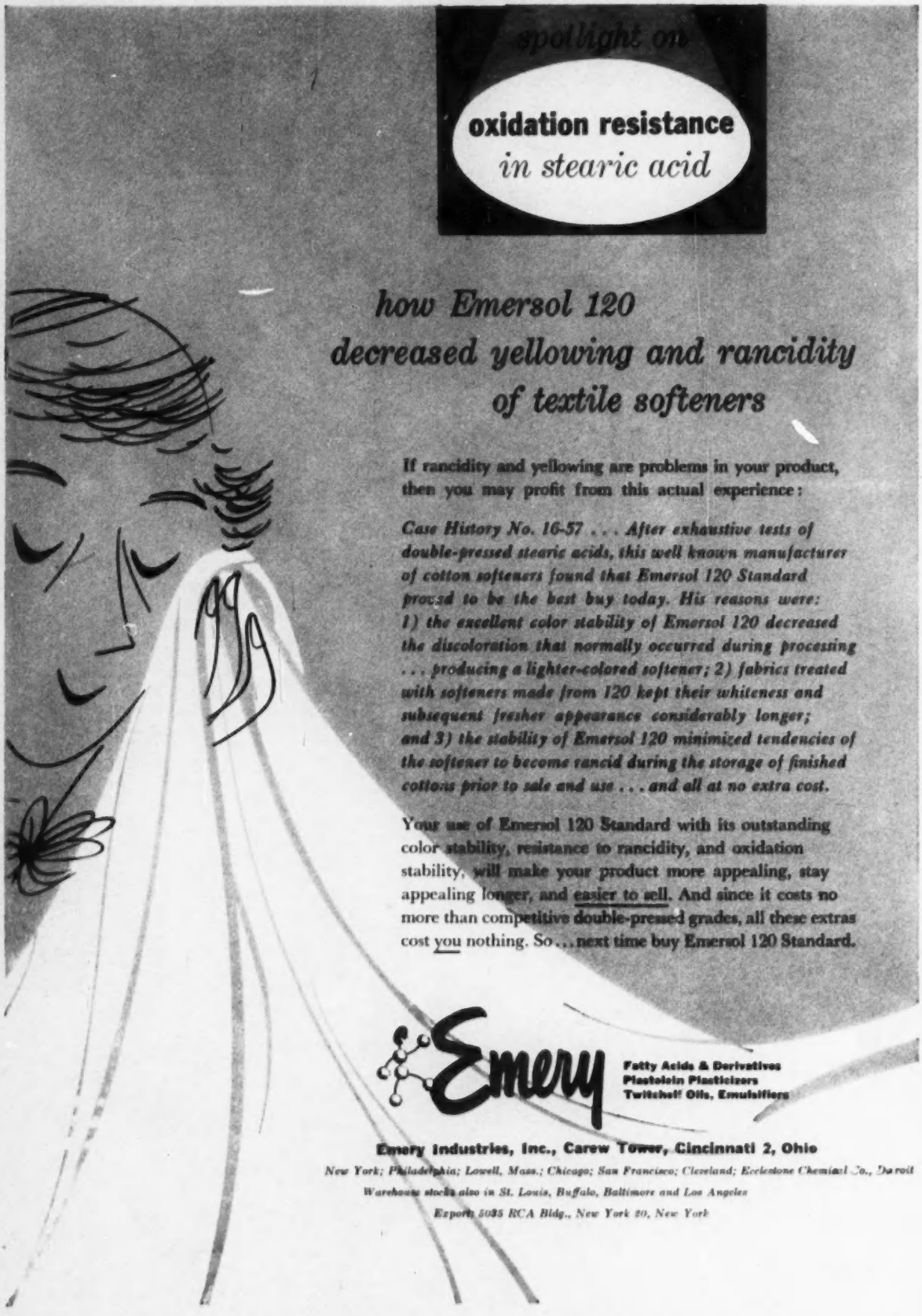
Du Pont Dyes



spotlight on

oxidation resistance
in stearic acid

how Emersol 120 decreased yellowing and rancidity of textile softeners

If rancidity and yellowing are problems in your product, then you may profit from this actual experience:

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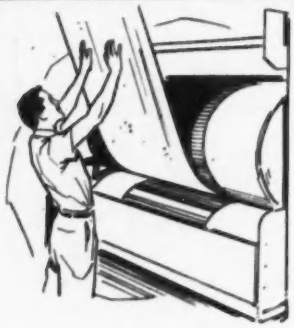

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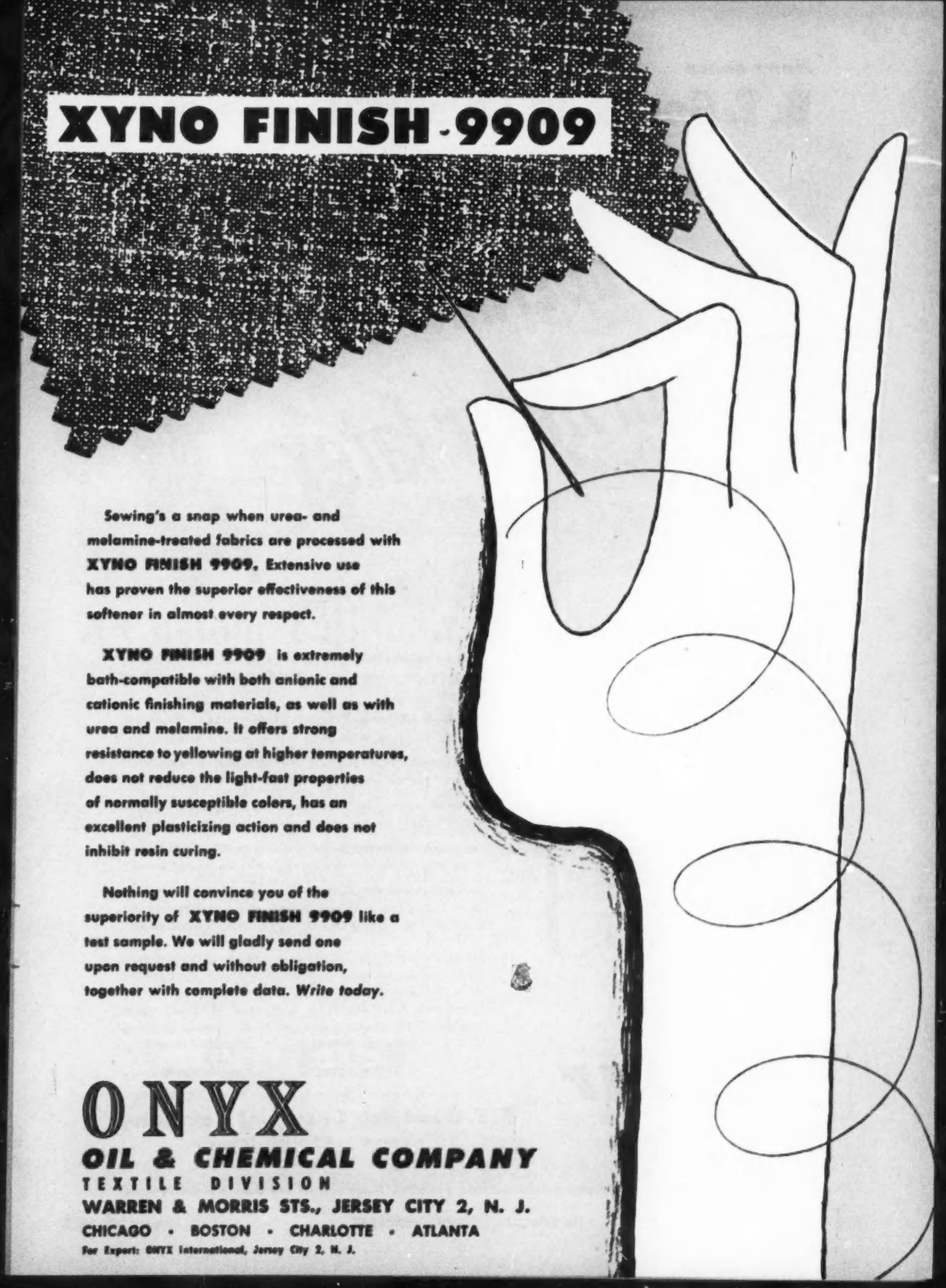
XYNO FINISH-9909



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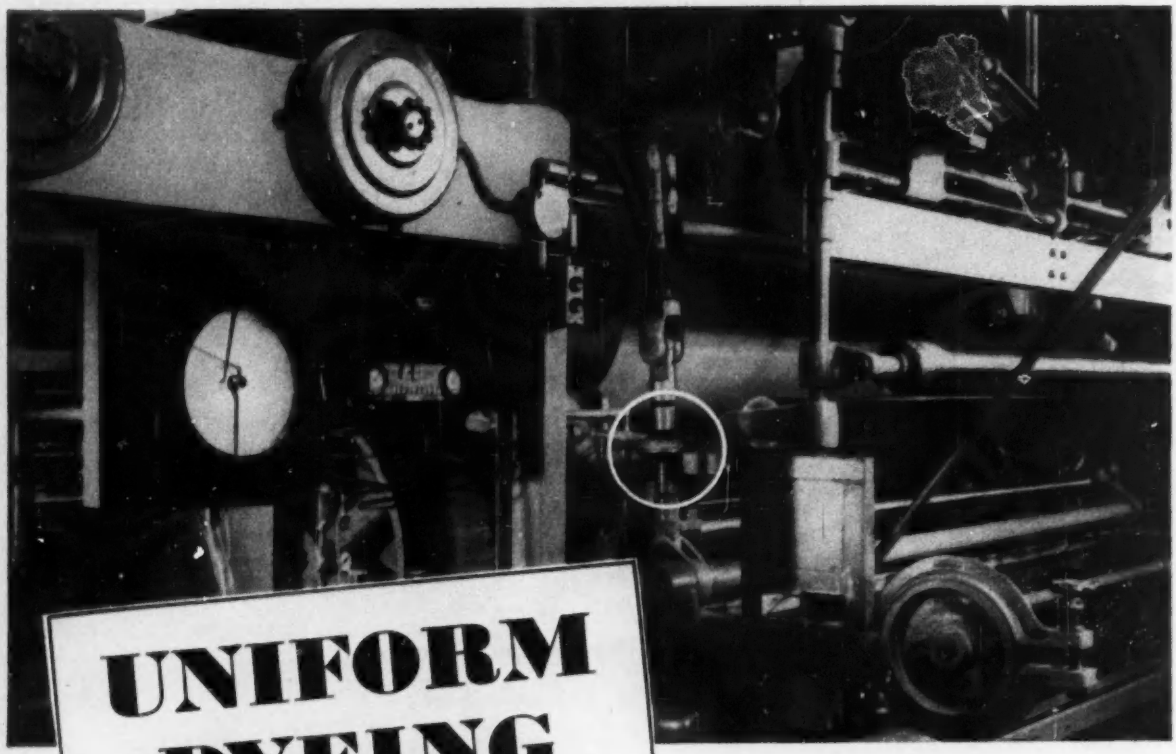

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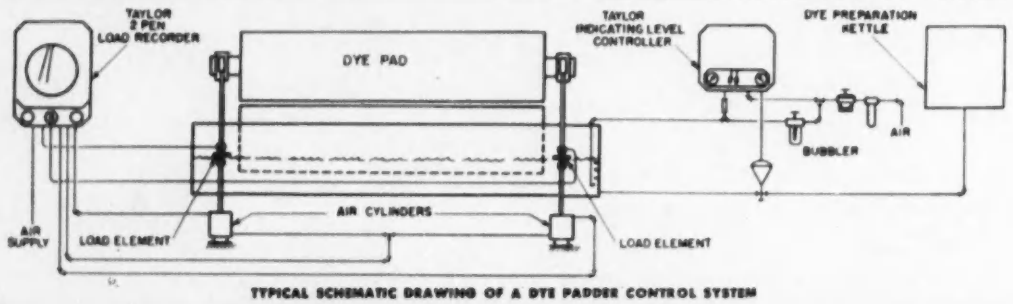

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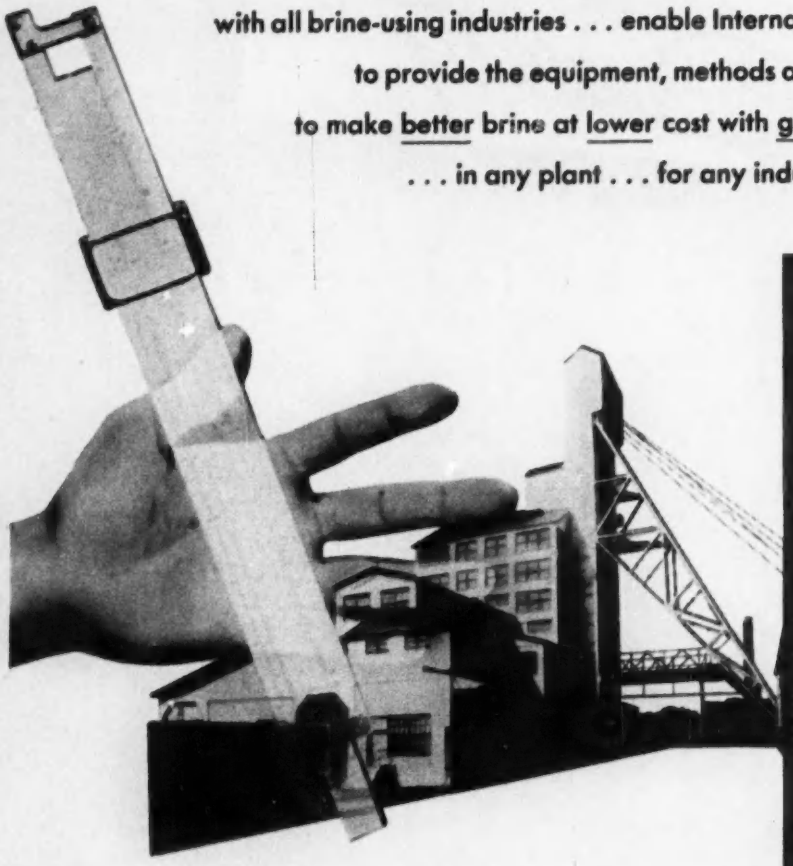

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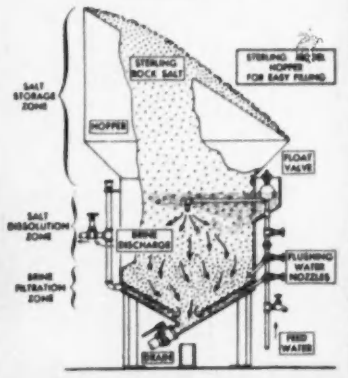

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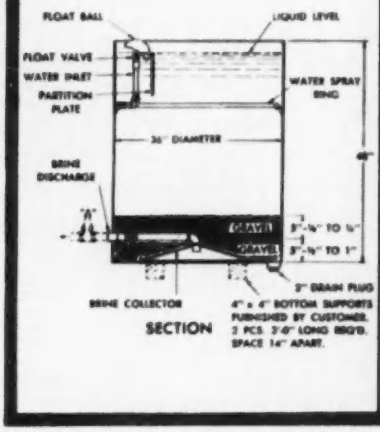

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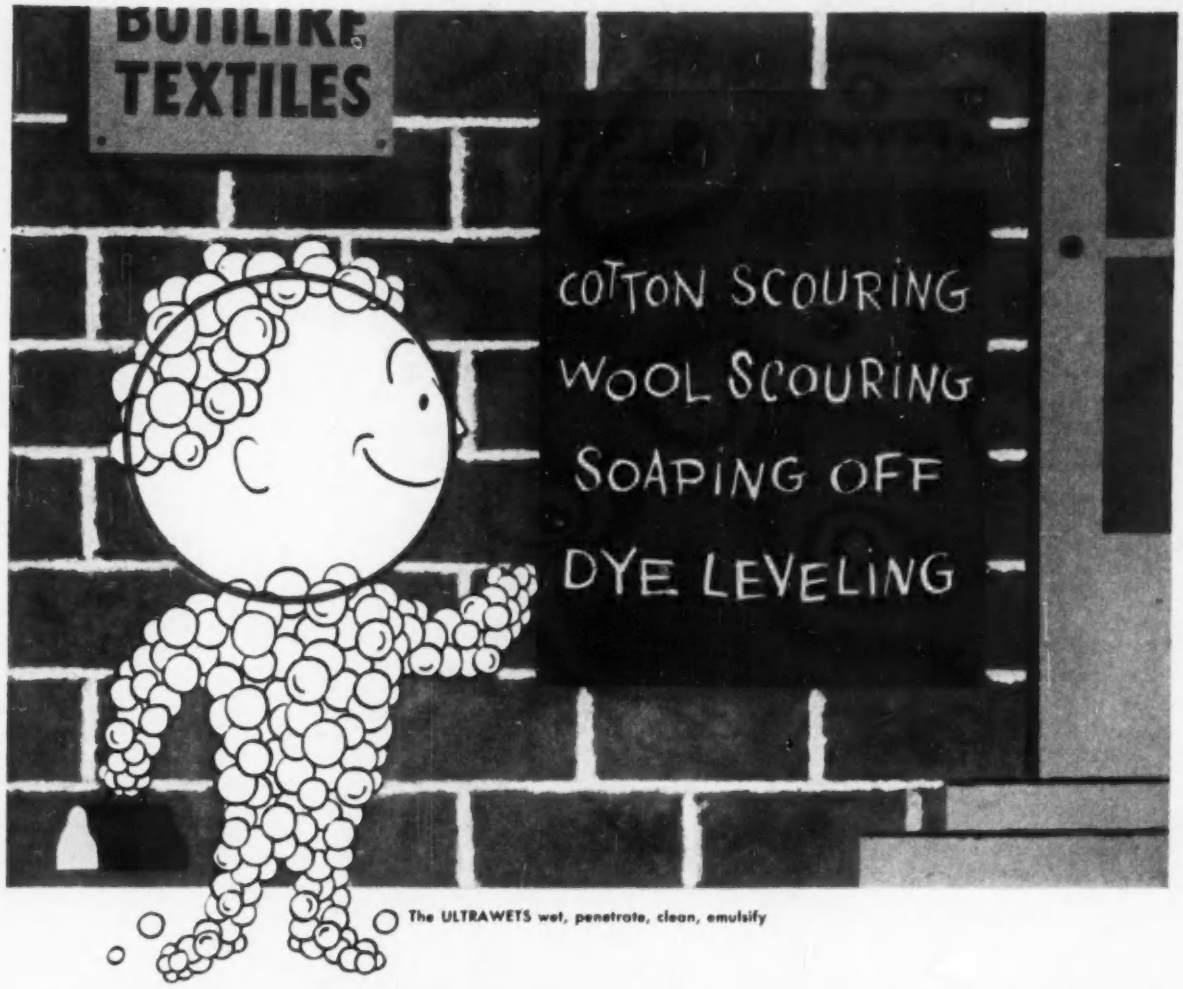

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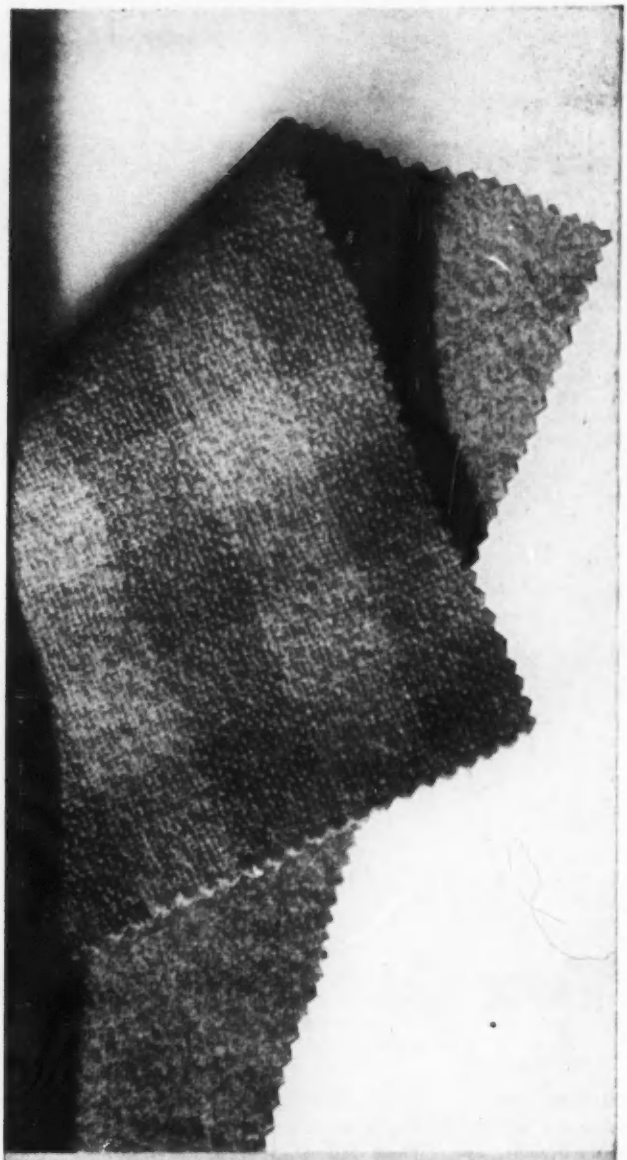

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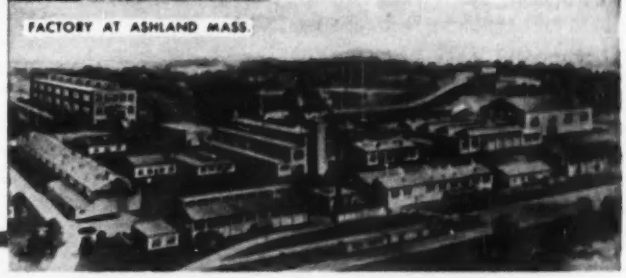

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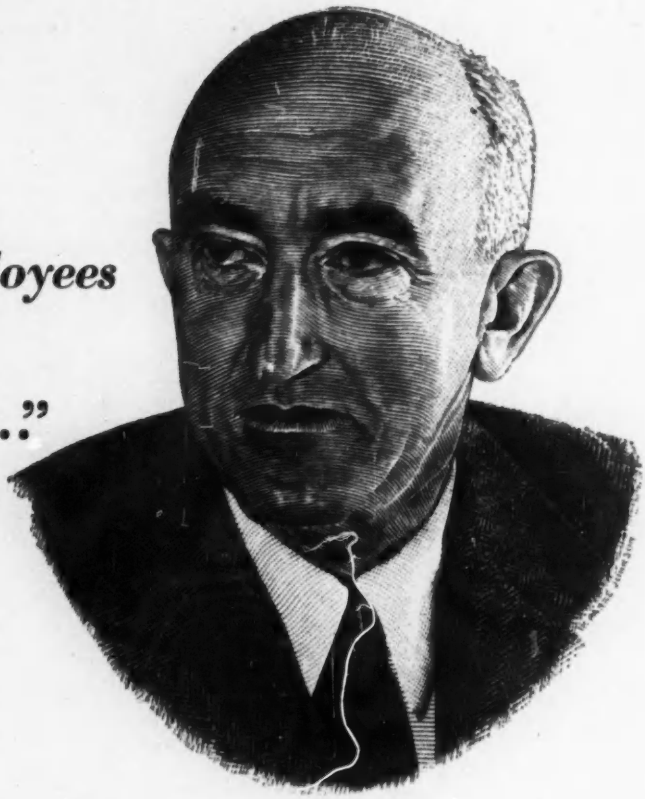

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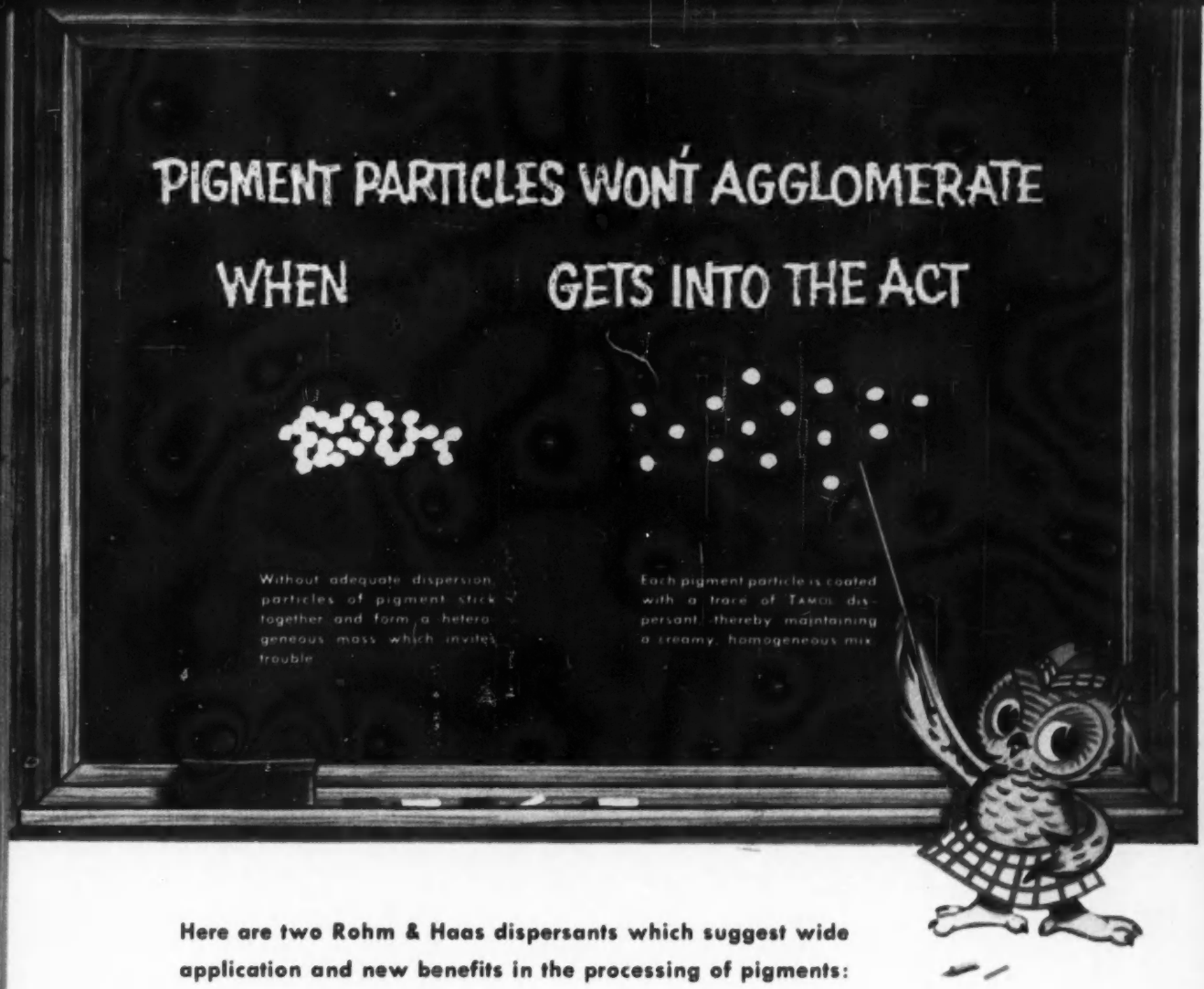
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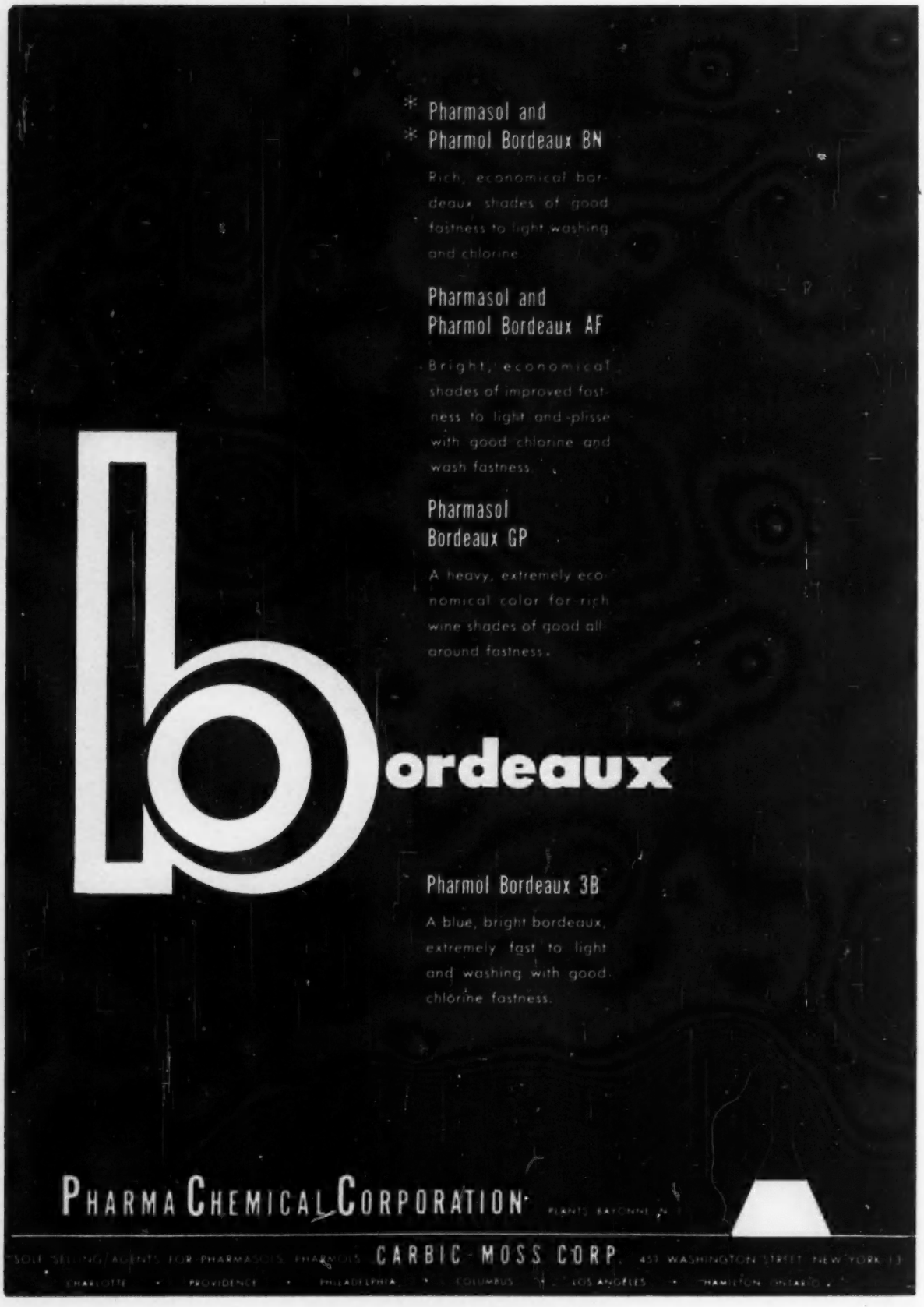
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Proceedings of the

American Association of Textile Chemists and Colorists

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Editor of Proceedings: Carl Z Draves, 30 Lahey St, New Hyde Park, N Y

JANUARY 17, 1955

ONE HUNDRED AND NINETY-FOURTH COUNCIL MEETING

THE Council held its 194th meeting in the Hotel Roosevelt, New York, N Y, on Friday morning, November 19, 1954. Present were President J Robert Bonnar, presiding; George L Baxter, Samuel L Hayes, Joseph H Jones and George O Linberg, vice presidents; Albert E Sampson, treasurer; Leonard S Little, chairman of the Executive Committee on Research; Carl Z Draves and P J Wood, past presidents; Elmer E Fickett, Ernest R Kaswell, John P Ploubides and Robert D Robinson representing Northern New England; Raymond W Jacoby, Thorwald Lawson and Edward W Lawrence representing Rhode Island; Raymond J Carey representing Western New England; Irwin J Smith representing Hudson-Mohawk; J Edward Lynn representing Niagara Frontier; Matthew J Babey, Charles W Dorn, John H Hennessey, Paul J Luck, Donald E Marnon and James J Marshall representing New York; Carleton T Anderson, Edward C Diehl, Harry L Morgan, Ange E Raimo, Ernest E Rettberg, Jr and Jackson A Woodruff representing Philadelphia; Walter M Scott representing Washington, Harley Y Jennings and R Hobart Souther representing Piedmont; H Gillespie Smith representing Southeastern; Joe D Mosheim representing South Central; Arthur T Brainerd and Eric W Camp representing Mid-West; Kenneth H Barnard of the Conventions Committee; William A Holst of the Committee on Constitution and Bylaws; Albert E Johnson of the Corporate Membership Committee; Percival Theel of the Publications Committee; Frederick V Traut, Chairman of the Philadelphia Section; and Harold C Chapin and Richard R Frey of the secretary's office.

The secretary's report of the 193rd Council meeting and financial report of October 28, and the treasurer's report of November 1, were accepted. The treasurer proposed that reserves for future expenditures not immediately needed be invested in ninety day US Treasury certificates in amounts approved by the Appropriations Committee. This was approved. Harry L Morgan was appointed treasurer for the Convention of 1955, replacing Richard B Stehle, resigned.

For the Executive Committee on Research Mr Little expressed the hope that certain fabrics tested by the Army might be available for comparative tests by the laboratory methods of the Association. The possibility of cooperating with medical authorities on dermatitis tests was still under consideration. Dr E W K Schwarz was working on organization of sectional research committees. George H Hotte was working on definitions in cooperation with representatives of other organizations. Mr Seibert was continuing his work on the Fade-Ometer and comparisons with daylight fading. Mr Dorn reported plans for another atomic bomb test in which Dr Stiegler would represent the Association in studies of effect on fabrics. Mr Johnson presented plans for Corporate membership solicitation, which were discussed at length and referred back to his committee.

CALENDAR

COUNCIL
Jan 21 (Hotel Statler, New York), Apr 29 (Hotel Dennis, Atlantic City, N J), June 17.

NATIONAL CONVENTIONS
Sept 22-25, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J; 1956 (Waldorf-Astoria, New York); 1957 (Boston).

HUDSON-MOHAWK SECTION
Jan 14, Feb 25, April 15 (Jack's Restaurant, Albany, N Y); May 20 (Ladies Night); June 24 (Annual Outing).

MID-WEST SECTION
Feb 12 (Bismarck Hotel, Chicago, Ill); Apr 16 (Netherlands Plaza, Cincinnati, O); June 11 (Lake Lawn Lodge, Delavan, Wis).

NIAGARA FRONTIER SECTION
Jan 14 (Buffalo); Mar 4 (Hamilton, Ont); April 22 (Buffalo); June 24 (Outing).

NEW YORK SECTION
January 28 (Georgian Room, Hotel Statler, New York); February 25 (Skytop, Hotel Statler, New York); March 18, April 22, May 20 (Kohler's Swiss Chalet, Rochelle Park, N J).

PHILADELPHIA SECTION
Jan 14 (Kugler's Restaurant, Philadelphia, Pa).

PIEDMONT SECTION
Jan 29 (Poinsett Hotel, Greenville, S C); Apr 30 (Robert E Lee Hotel, Winston-Salem, N C); June 10-11 (Mayview Manor, Blowing Rock, N C); Oct 29 (Hotel Wm R Barringer, Charlotte, N C).

SOUTHEASTERN SECTION
Feb 12 (Alabama Power Co and Pureloy Hotel, Talladega, Ala); Apr 23 (American Legion Club, Lindale, Ga); June 3-4 (Annual Outing, Radium Springs, Ga); Sept 10 (Ralston Hotel, Columbus, Ga); Dec 3 (Atlanta Biltmore, Atlanta, Ga).

WASHINGTON SECTION
Feb 11 (Washington); May 20.

WESTERN NEW ENGLAND SECTION
Jan 28, Mar 18 (Rapp's Restaurant, Shelton, Conn); May 13 (Ladies Night); June 17 (Annual Outing); Sept 16 (Rapp's); Nov 4 (Hartford, Conn); Dec 16 (Rapp's).

For the Publications Committee, Professor Theel reported that Winn W Chase would head the editors of the new list of resin-bonded pigments for the *1955 Year Book*. This list would probably be restricted to formulations made in this country, in each of which the principal pigment also is made here. "RB" members would be assigned to the pigments. The chairman of the Publicity Committee would hereafter be a member of the Publications Committee. Robert W Joerger would succeed John N Dalton as a member of the American Dyestuff Award Committee.

William A Holst was appointed secretary of the Colour Index Editing Committee, and Charles A Sylvester, a member. Mr Sampson reported that printing was progressing according to schedule for publication late in 1955, and that the Marketing Committee hoped to have more information on binding for the January Council meeting.

Mr Barnard reported excellent financial returns from the Atlanta Convention. Thanks were voted to the four sections of the Southern Region, and their committee, for their hospitality and successful management. The Convention of September 22 to 25, 1955 in the Chalfonte-Haddon Hall, Atlantic City, will be under auspices of the Philadelphia Section with Frederick V Traut chairman. For the Perkin Centennial Celebration of 1956 Mr Jacoby's committee is planning special attractions for students. Mr Linberg is to be chairman, and Mr Barnard, secretary, of the Committee on Conventions. Arthur I Hultberg and Ernest R Kaswell are becoming members, and Joseph H Jones is retiring from the latter Committee.

At request of the Western New York Section, and in recognition of Canadian members, its name was changed to Niagara Frontier Section. An appropriation was voted for expenses of the Section.

Presented by Mr Hayes for the Committee on Membership and Local Sections, each of the following was elected to the class of membership specified:

CORPORATE

Textile Service Company
Harris Research Laboratories, Inc

(Concluded on page P58)

1954 Intersectional Contest——

A STUDY OF FACTORS WHICH INFLUENCE THE FASTNESS TO CROCKING*

NEW YORK SECTION

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Crocking or the transfer of color from fabric upon frictional contact with other surfaces, has been a problem of long standing and the literature yields a number of proposals for alleviating, if not eliminating, the difficulty. Over the years a number of methods have been proposed for the quantitative determination of crocking and methods have been standardized which control most of the variables encountered in such measurements. Special refinements have been developed which produce measurement for research purposes of small differences in crocking.

The effects of several methods suggested for reducing crocking were measured on both commercially and experimentally dyed cloth by standard testing procedures and by means of refined methods. Data and illustrations show interlaboratory reproducibility of crocking measurements and the effects on crocking of different degrees of fabric prepare, different classes of dye and different methods of application of the same dye, and an evaluation of a few regularly applied aftertreatments are given.

INTRODUCTION

CROCKING, or the transfer of color from a dyed surface to another by rubbing, has been a recurring difficulty of varying importance to textile colorists for many years. Almost twenty years ago E B Adams *(1)*, writing about crocking, expressed the opinion that this defect has not been, nor is it likely to be, solved.

Consequently when dyed goods have shown excessive crocking it has been customary for the colorist to use any expedient he could find to eliminate the trouble for the color involved or to reduce it sufficiently for goods to be disposed of successfully.

The present trend of consumer demand for more widespread use of colors in vivid, deep shades is intensifying crocking troubles and the problem is not likely to be solved without a general and fundamental investigation of each of the factors involved. As a start in this direction this paper proposes to present as much information as can be gleaned from the scanty literature on the subject, to consider the methods of measuring crocking and to report the results of experimental work which has been done to test some of the factors generally believed to influence crocking.

PREVIOUS WORK ON CROCKING

In a search of the literature there were found only 17 papers that have been published in the past 30 years on this subject, of which only 11 deal with crocking as the primary topic. During the same period 1 United States and 3 foreign patents were granted for processes designed to minimize crocking. The *1951 Review of Textile Progress (2)* referring to crock testing states, "In spite of the practical importance of these tests, the literature is surprisingly devoid of reference to investigations in the fastness properties as such."

Some of the more fundamental work on crocking was reported in 1929 by Bean & Rowe *(3)* on cotton, in 1940 by Royer & Millson *(4)* on wool and in 1947 by Millson, Watkins & Royer *(5)* also on wool. In these three studies microscopical examination of fibers was made at various stages during the dyeing process and during various aftertreatments to determine the location of dye on and within the fibers.

Bean & Rowe *(3)* found that in the initial stage of dyeing cellulosic fibers with azoic dyes the color was precipitated in finely divided form partly within and partly on the surface of the fibers. If the cellulose was subsequently treated to cause the fibers to swell, the dye particles formed coarser aggregates within the cell walls and lumen. Treatment with dilute soap solution with or without sodium carbonate removed loose surface coloring matter and also produced aggregation within the cell wall. If carried on too long, however, the process became reversible and the rubbing fastness was adversely affected.

Millson and his co-workers *(4, 5)* observed that the crocking of dyed wool was affected by a number of conditions, such as incomplete scouring, presence of dye solvents, hard water, drying, shearing, chlorination, Glauber's salt, temperature, pH and dye concentration. In general, though, the crocking was directly related to the amount of dye on the fiber surface. Treatments that improved the degree of dye penetration into the fiber, such as longer dyeing at the boil, improved the crockfastness of the dyed material.

With regard to the effect that shearing has on the crocking of woolen fabrics, the following statement was made in an earlier article by von Bergen, Crowley and Brommelsiek *(6)*: "In the finishing department the most difficult obstacle to overcome was the excessive crocking, which appeared after shearing." They found that careful washing after fulling, with another washing in the neutralizing process and a run through a Derby dry-cleaning machine after shearing remedied the trouble.

In discussing Naphthol AS dyeings on cotton, Williams *(7)* mentioned several procedures for improving the crockfastness: use of a naphthol of good substantivity, hydro-extraction after naphtholation, intermediate drying after naphtholation, use of wetting agents, and boiling in concentrated soap solution (8 grams of soap per liter) as an aftertreatment to remove unfixed and loosely attached dye. These observations were also confirmed by Blackshaw *(8, 9)* who added that the relative crockfastness of two cloths dyed in the same manner with azoic colors is affected by the physical construction of the fabric and the nature of the surface.

In a review on the subject of crocking

* Presented by Percy J Fynn on Sept 19, 1954 at Atlanta, Ga.

Forster and his co-workers *(10)* discussed many of the preceding factors. In addition they suggested other treatments which improve crockfastness of naphthol-dyed cotton: effective cleansing of material before dyeing, avoidance of excessive soluble oil or protective colloids in the naphtho' bath, addition of formaldehyde to the naphthol bath, and the use of tannic acid in the soaping bath.

The above conclusions of various investigators indicate that fastness to rubbing can be affected by many things, and all agree that careful preparation of the cloth and the use of techniques which insure good dye penetration and which remove residual surface dye will *"minimize"* the crocking. However, none of the suggested techniques present a definite solution to the problem.

MEASUREMENT OF CROCKING

Before it is possible to gauge progress in the elimination of crocking or to judge differences in degree of crocking, it is obvious that an appropriate method of measuring the phenomenon must be adopted.

A rough and ready test for crocking still often resorted to is the hand rubbing of a white cloth against the surface of the dyed fabric. It is assumed that the one using this test applies it with sufficient vigor to be satisfied that the cloth being tested does not crock too much to prevent its use for whatever purpose is in mind. There are so many uncontrolled variables in such a test that its lack of reproducability renders it unreliable as a fair means of comparison. For the elimination of these variables a number of refinements have evolved. An early German method, once used as a standard, proposed laying the dry, dyed goods on a flat, firm surface and with a white unfinished lapping cloth wrapped around the index finger, making 10 strokes about 10 centimeters long. This proposal tends to define a number of the conditions, but doesn't accurately fix them all. Bean and Rowe *(3)* refer to what is implied as a recognized method with the statement: "Fastness to rubbing was determined in the normal way by firmly drawing the dyed material (presumably in yarn form) a number of times over white material. Differences in the fastness of a series (of dyeings) were established more definitely from the number of strokes required to produce a clearly visible stain, rather than by comparing the depth of the stain produced in each case by a given number of strokes."

Steward's drum method *(11)* was proposed as a means of mechanizing the test. This procedure recommends that either yarns or fabric to be tested be wrapped snugly around a small drum. The drum is rotated at a fixed speed while a stationary rubbing block faced with a removable piece of white cloth is pressed against the dyed goods on the rotating drum for a specified number of revolutions. The intensity of the resulting "mark-off" is measured with a Lovibond Tintometer *(12)*. While a number of conditions are fixed by the constructional features of the machine they are not defined and several important conditions are still left to the discretion of the operator.

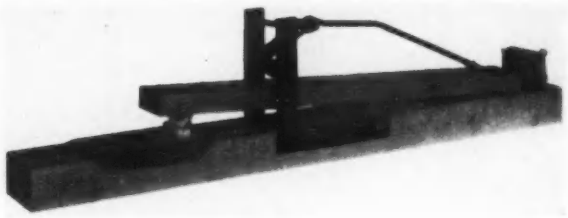

Figure 1
Crockmeter

The first method which describes attempts to fix and define practically all of the variables is based on a machine invented by Derrett-Smith and Bradley *(13)*. A uniform velocity, horizontal reciprocating stroke is obtained from an electric-motor-driven heart cam. The dyed-sample holder is a hardwood block of 210 grams weight with its rubbing surface curved cylindrically to a radius of 1¼ inches. The sample is fitted smoothly to the curved surface and clamped; the block is rubbed back and forth at 42 cycles per minute over a 5½ inch-stroke pressed by its own weight against a stationary strip of bleached dress linen supported horizontally beneath the block by a smooth flat plate and kept under tension by an 820-gram weight clamped to one end which overhangs the end of the plate. The degree of crocking is judged at the end of 50, 100 and 250 cycles.

The form of the crock tester required for the standard crock test procedure of the American Association of Textile Chemists and Colorists *(14)* (see Figure 1) is somewhat similar to the Derrett-Smith machine except that, in the interest of simplicity, portability and low cost, it is designed to be hand driven. In place of the curved block a wooden peg of definite diameter is used and the white test cloth of specified construction is held by a clamp over the end of the peg and is rubbed against the dyed sample supported on a firm horizontal surface. The length and speed of the stroke, the number of strokes, the force pressing the test cloth and sample together are all defined or fixed by the conditions of test. An evaluation of color transfer under these conditions is made by comparison with a standardized, graded color transference chart. As a tool for use by dyers and for consumer testing, the AATCC method and the Crockmeter have proven adequate.

Upon occasion refinements on the AATCC tester have been necessary for special investigations where particular conditions have been incorporated in the testing procedure. One such adaptation used by Millson and co-workers *(5)* involved the use of a double peg for simultaneous testing of wet and dry crocking of a sample.

A more recent refinement of the AATCC crockmeter has been developed at the laboratories of the Interchemical Corporation *(15)*. This device is mechanically driven for ease of operation and to eliminate variations in speed. The force of the driving rod is exactly parallel to the sample being tested so that an even, downward pressure is exerted by the crocking peg throughout the entire cycle. A guide bar is included to eliminate sidewise wobble of the carriage while running. The wooden peg used in the AATCC instrument has been replaced by one of Micarta so as to eliminate nonuniform hardness on the end of the peg due to the grain of the wood.

The sample strip of fabric, clamped at one end and horizontally supported by a ground glass plate, overhangs the edge of the plate and is held at constant tension by a weight hung from the free end. The driving motor is controlled by means of a preset counter which switches off the machine after a predetermined number of cycles (Figure 2).

Studies by the Interchemical Corporation on the effect of temperature and relative humidity showed that they have a definite effect on crockfastness. Therefore, the crockmeter was enclosed in a box in which air is maintained at a predetermined constant temperature and humidity. An automatically thermo-regulated system based on moisture equilibrium with saturated solutions of selected salts provides the required controlled atmosphere. The cover of the box is made of Plexiglas and there are Plexiglas windows for visual observation. Three holes with rubber sleeves are included in the walls to permit entry of hands for manipulating the samples and the in-

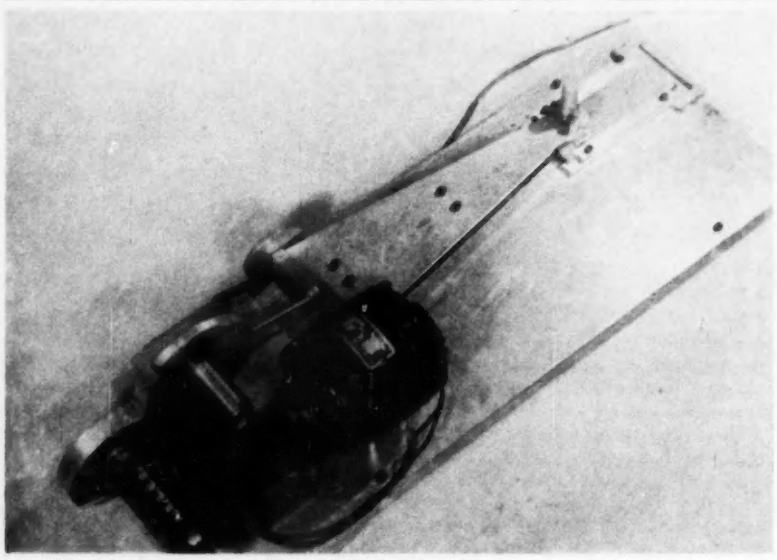

Figure 2
Pre-set counter for controlling driving motor of Crockmeter

strument. Additional equipment in the box includes a hygrometer for checking relative humidity.

The samples are brought to equilibrium with the conditioned air in the constant humidity box, which encloses the crockmeter, and they are then crocked under reproducible tension for 100 cycles. A constant tension is important because of the effect of this tension on the friction between the materials used for the test.

To eliminate differences in perception and judgment inherent in visual examination, the amount of color transferred onto the white test cloth is determined photometrically.

PRESENT WORK

In order to fit the scope of the present paper to the time available for its preparation and presentation, it was decided to use only one fabric, namely 80 x 80 cotton print cloth. It was then decided to investigate the extent to which crocking is effected by a) fabric preparation, b) the type of color used, c) the method of application of the color, and d) aftertreatments and finishes. Three methods of fabric preparation and several classes of color were used. In some instances, the same color was applied by several different methods.

In addition to the laboratory dyeings made expressly for this investigation, four pieces of run-of-the-mill commercial dyeings known to have poor crock ratings were obtained and used to check the reproducibility of the crockfastness ratings between laboratories and to study the effects of several commercial aftertreatments and finishes.

PREPARATION OF COMMERCIAL DYEINGS——These pieces were prepared in the plant from 80 x 80 cotton greige goods as follows:

1) Mercerization in the greige in open width in 40° Tw caustic at 120° F.
2) Spray washing in frame followed by one tub of hot water at end of frame.
3) Continuous bleaching starting with 1% sulfuric acid at 60° F.
4) Hot Tensitrol washing.
5) Nip through 3% caustic into J box at 215° F for 2 hours.
6) Hot Tensitrol washing.
7) Treated with chlorine bleach into J boxes for 2 hours.
8) Hot Tensitrol washing.
9) Saturation with sulfur dioxide.
10) Drying and framing.

The four commercially dyed fabrics used were a naphthol red, a naphthol maroon, a sulfur brown and a sulfur black. These fabrics were dyed as follows:

Red — The fabric was naphthol dyed on a continuous machine with 1.60 oz/gal Naphthol AS (Pr 302) which was padded on and dried in a hot flue. The color was developed by coupling with 1.30 oz/gal of diazotized Red GL base (CI 69). This was followed by a soaping at the boil with 2% detergent.

Maroon — This fabric was also naphthol dyed on a continuous machine with 1.28 oz/gal Naphthol AS (Pr 302) and 0.10 oz/gal Naphthol ASG (CI 309), which were padded on and dried in a hot flue. Coupling was done with 2.13 oz/gal of diazotized Garnet GBC Base (CI 17) and the goods were soaped at the boil with 2% of detergent.

Brown — The goods were dyed with a combination of sulfur dyes on a continuous machine using 5.60 oz/gal Liquid Brown FCF, 3.50 oz/gal Liquid Brown FLCF and 1.88 oz/gal Liquid Brown GNRCF padded on and dried in a hot flue. This was followed with the same dyes at the same concentrations padded on and run wet directly into a steamer at 210° F. The color was oxidized with 2% of chrome and acetic acid and given a cold rinse followed by a hot rinse.

Black — These goods were dyed with sulfur dyes on a jig with 30% (owf) Liquid Black 5GCF (CI 978) and oxidized with 2% of chrome and acetic acid. This was followed by a soaping at the boil with a surface-active agent and soda ash.

All four dyed fabrics were given the starch finish with 10 pounds of corn starch and 10 pounds of No. 36 sulfonated tallow per 150 gals padded at high temperature, followed by drying, framing and calendering.

PREPARATION OF LABORATORY DYEINGS——All of the special laboratory dyeings were made on fabric at three different levels of preparation. A piece of greige was divided into three parts and all parts were processed on continuous bleaching machinery. But each was removed from the process at a different stage so that one was boiled off only, the second was boiled off and bleached and the third was boiled off, bleached and mercerized. (For convenience in subsequent references these pieces are identified as Fabrics A, B and C, respectively.)

Fabric A was processed in an open boil in 5% of caustic; Fabric B was boiled and then chlorine bleached, washed and given a sulfur dioxide antichlor; Fabric C was first mercerized in the greige then boiled off and bleached in the continuous bleacher as described previously for the preparation of the commercially dyed goods.

Each of these three pieces was split warpwise into narrow widths for subsequent laboratory dyeing so that the effect of different degrees of preparation on the crockfastness of each of the dyeings could be observed.

Three color-application procedures were chosen for a comparison of relative crockfastness: vat dyeing, naphthol dyeing and printing. The vats were applied by three different methods: pad-steam, Williams Unit, and pad-jig; the naphthols were applied in the laboratory by padding and jig developing, and printing was done with vats, azoics and pigments.

APPLICATION OF VAT DYES——The vat colors used for all three methods of application were: Anthraquinone Jade Green (CI 1101), Anthraquinone Vat Orange RRT (CI 1098), Anthraquinone

Vat Brown R (CI 1151), and Anthraquinone Vat Navy Blue RT (CI 1100).

These colors were applied at 8.0 oz/gal on a pad and then hot-flue dried at 290°F. The padding for all methods of development was done together on the same equipment with a pick-up for Fabric A of 60%, Fabric B of 74% and Fabric C of 60%. Fabric A had previously been padded with 1.0 oz/gal of a wetting agent and dried.

The pad-steam development was done as follows: The dye-padded cloth was given a chemical pad with a 90% pick-up of a solution of 6.0 oz/gal caustic soda, 6.0 oz/gal of sodium hydrosulfite and 0.2 oz/gal wetting agent, and was steamed 20 seconds. The dye was then oxidized for 5 minutes at 140°F with 2.67 oz/gal of soda ash. A 15-minute rinse at 110°F was followed by air drying.

The Williams unit development was carried out at 20 yards per minute at 200°F using 5.0 oz/gal of caustic soda and 5.0 oz/gal of sodium hydrosulfite (except the Anthraquinone Brown R, which had 4.0 oz/gal each of caustic and hydro with 16.0 oz/gal of Glauber's salt). Oxidation was accomplished with 2.67 oz/gal each of sodium dichromate and acetic acid, 56%. After rinsing, the fabric was soaped 15 minutes at 160°F in 0.67 oz/gal AATCC standard chip soap and 0.26 oz/gal of soda ash, rinsed again for 15 minutes at 110°F, and finally air dried.

The pad-jig development was carried out on a laboratory jig where the colors were jig reduced and developed as follows:

The Anthraquinone Jade Green and the Anthraquinone Vat Navy Blue RT were processed alike. They were reduced at 140° F with 1.0 oz/gal caustic soda and 1.0 oz/gal sodium hydrosulfite. The goods were run 10 ends, the solution dropped, and then rinsed 6 ends. Oxidation was accomplished in a fresh bath, 6 ends, at 130° F with 2.0 oz/gal sodium bicarbonate and 0.75 oz/gal sodium perborate and rinsed 4 ends. Soaping was carried out for 20 minutes at 212° F with 0.75 oz/gal of soap and 0.4 oz/gal of soda ash. After 6 ends rinsing the goods were squeezed and dried.

Except for development at a lower temperature of 120° F the method for Anthraquinone Vat Orange RRT was the same as for the Green and Navy Blue.

The Anthraquinone Brown R was reduced at 120° F with 1.0 oz/gal caustic soda and 1.0 oz/gal sodium hydrosulfite. After 1 end, 2.0 oz/gal of sodium chloride was added, and after the second end, another 2.0 oz/gal of sodium chloride was added. The goods were run for 8 additional ends, and then rinsed for 6 ends. The material was oxidized in a fresh bath, 6 ends, at 130° F with 2.0 oz/gal sodium perborate. After 4 ends rinsing the goods were soaped 20 minutes at 212° F with 0.75 oz/gal soap and 0.4 oz/gal soda ash, rinsed 6 ends, squeezed and dried.

APPLICATION OF AZOIC DYES ——Fabrics A, B and C were each padded to 80% pickup at 140°F with a pad liquor composed of 3 oz of Naphthol AS (Pr 302), 9 oz of denatured ethyl alcohol and 1½ oz of caustic soda plus sufficient boiling water to form a clear syrupy amber naphtholate, which, when strained into a "spring" bath containing 1½ oz of caustic soda, was brought to one-gallon volume. The naphtholated material was dried in warm air. Four dyeings were made on each of the Fabrics A, B and C using 10% (owf) of Fast Scarlet 2G Salt (Pr 94), Fast Yellow GC Salt (Pr 275), Fast Garnet GBC Salt (CI 17) and Fast Blue BB Salt (Pr 258). Each was prepared by pasting with 2% of nonionic stabilizing agent of high molecular organic condensation derivation and dissolving in water at 50°-60°F, followed by straining into a coupling bath containing 1/3 oz/gal of acetic acid, 56%. The fabrics were jig coupled at 55°-60°F with a run of 4 ends.

After coupling, the goods were rinsed clear, soaped 10 minutes at 200°F with ½ oz/gal of olive oil soap, and hot washed 10 minutes at 160°F with 2% of a nonionic surface-active agent to remove free color. The material was then air dried.

APPLICATION OF PRINTED DYES ——Four colors in each of three dye types, namely, vat type, pigment type and azoic type, were selected for printing.

The vat dyes——Anthraquinone Jade Green (CI 1101), Indigoid Vat Brown G (Pr 121), Indigoid Vat Brilliant Blue 4B (CI 1184) and Indigoid Vat Pink FF (Pr 109)——were made up at 1 lb/gal of Amberflo print gum containing 1.2 lbs/gal of potassium carbonate and 3 lbs/gal of sodium sulfoxalateformaldehyde. The printing was done in the laboratory on a regular production ribbon print machine, which has a crush roller that reproduces print plant conditions. All prints were plant vat aged 15 minutes, oxidized with chrome and acetic acid, and washed for 30 minutes and dried.

The azoic dyes——Rapidogens Red GS (Pr 168), Blue BN (Pr 163), Scarlet RS (Pr 170) and Violet B (Pr 351) in powder form——were made up as 4% print pastes with Cellosolve and caustic soda. The prepared solutions were cut into a mixture of Amberflo and Keltex gum. The prints were acid aged twice for 4 minutes each, open washed twice, and finally rope washed and dried.

The pigment colors——Yellow FY2G, Blue FC2G, Green FJB and Black F2K ——were cut 1 to 3 in a low crock formula using special low crock clears. All prints were cured 3 minutes at 300°F.

TABLE I

COMMERCIAL DYEINGS
CROCK RATINGS BY FIVE LABORATORIES

	Red, Naphthol		*Black, Sulfur*		*Maroon, Naphthol*		*Brown, Sulfur*	
Sample	*dry*	*wet*	*dry*	*wet*	*dry*	*wet*	*dry*	*wet*
				fabric face				
warpwise	4 4 4	2 3 3	4 4 3	0 1 0	4 4 4	2 3 3	4 4 4	3 3 3
	4 4	3 3	4 4	1 2	4 4	3 3	4 4	3 3
fillingwise	4 4 4	3 3 3	4 4 3	0 1 0	4 4 4	2 3 3	4 4 4	3 3 3
	4 4	3 3	4 4	1 2	4 4	3 3	4 4	3 3
				fabric back				
warpwise	4 4 4	2 3 3	4 4 3	0 1 0	4 4 4	2 3 3	4 4 4	2 3 3
	4 4	3 3	4 4	1 2	4 4	3 3	4 4	3 3
fillingwise	4 4 4	2 3 3	4 4 3	0 1 0	4 4 4	2 3 3	4 4 4	2 3 3
	4 4	3 3	4 4	1 2	4 4	3 3	4 4	3 3

TABLE II

CHECK OF INTERLABORATORY AGREEMENT (SINGLE OBSERVER)

Laboratory	*Laboratory Average* $\bar{X}$	*Grand Average* $\bar{\bar{X}}$	*Sample Size*	*(Control Limits) Upper*	*Lower*	*Remarks*
1	3.681					
2	3.722	3.519	144	3.578	3.460	1 and 2 significantly higher
3	3.476					
4	3.271					4 and 5 significantly lower
5	3.444					

The control limits are calculated from $\bar{\bar{X}} \pm \frac{2\sigma}{\sqrt{n}}$ where

$\bar{\bar{X}}$ = grand average

σ = st dev of single obs = 0.357

n = number of individual crock ratings making up each laboratory average

AFTERTREATMENTS APPLIED TO COMMERCIAL DYEINGS——Of the four pieces of commercially dyed fabrics, two (the naphthol maroon and sulfur black) were selected to try the effect on crocking of several aftertreatments. The aftertreatments consisted of an extra scour, a melamine-formaldehyde resin, a synthetic-rubber latex and a silicone resin.

The scouring was carried out by hand on small samples at 110°F for 10 minutes in 5% of soap solution and was followed by several thorough rinses and frame drying for 20 minutes at 180°F.

The melamine-formaldehyde resin applied was of the Permel type. A formula of 7.5% of Permel resin, 1.8% of Aerotex Buffer DYC and 1% of Aerotex Accelerator AS was applied to the extent of 3% of solids on the cloth by one dip and one nip with 80% pickup. This was followed by drying at 220°F and curing for 1-2 minutes at 350°F.

A butadiene-acrylonitrile latex was applied to give five percent solids on the weight of the cloth; this was cured 3 minutes at 300°F.

A solution of 5% of Perma Par W emulsion (a polysiloxane) and 5% of organic catalyst CTA was used to give 1% of solids on the fabric in the silicone aftertreatment. After drying at 280°F, the silicone was cured 6 minutes at 320°F.

EXPERIMENTAL

The degree of crocking, dry and wet, of all except one set of samples was determined according to the procedure of AATCC Standard Test Method 8-52 *(13)* at five laboratories[1].

The four commercially dyed fabrics were used as a preliminary check upon reproducibility of ratings within these laboratories, upon agreement between laboratories and upon the effect of orientation of the fabric, *ie*, upon the possibility that the ratings might differ by a measurable amount depending upon which side of the fabric was used and the direction of the crocking motion. The ratings from these tests are presented in Table I.

It is interesting to note from Table I that the reproducibility and interlaboratory agreement are of a high order, and that there is no discernible difference in the results on face or back of the fabric or between warpwise and fillwise crocking motion. These results indicate that no particular care is necessary to orient the test samples except in the case of printed samples, which obviously must be crocked face upwards. It is realized that this generalization holds only for this particular fabric, which was used for all samples, and that the direction of crock could be important in fabrics not having a balanced construction like the 80 x 80 cotton cloth.

The extent of agreement also implies excellent uniformity of dyeing from place to place on the fabric inasmuch as the samplings were scattered at random over the pieces. The degree of uniformity of dyeing in mill-dyed pieces is not attainable in small-scale laboratory dyeings as will be seen in the data.

The agreement between laboratories

[1] The Naphthol dyeings, which were of limited size, were sent to only three laboratories.

TABLE III

AVERAGE CROCK RATINGS
(SINGLE OBSERVER)

Type of prepare	*Fabric A*	*Fabric B*	*Fabric C*
Vat-steam			
dry crock	4.20	3.98	4.03
wet crock	2.95	3.30	3.48
Vat-Williams			
dry crock	4.58	4.35	4.20
wet crock	3.58	3.73	3.80
Vat-jig			
dry crock	4.48	4.40	4.65
wet crock	3.25	3.65	3.60
*Naphthol			
dry crock	3.5	3.2	3.1
wet crock	2.5	2.4	2.4
Pigment prints			
dry crock	3.95	4.05	4.00
wet crock	2.03	2.75	2.45
Azoic prints			
dry crock	3.73	3.93	3.88
wet crock	2.45	2.60	2.78
Vat prints			
dry crock	3.95	3.73	3.68
wet crock	2.85	2.28	2.40

* Naphthol ratings given to 2 significant figures because only the results of 3 laboratories were averaged.

TABLE IV

SUMMARY OF FACTORS INFLUENCING CROCK RATINGS
(SINGLE OBSERVER)

Factors	*Factor Average* $\bar{X}$	*Grand Average* $\bar{X}$	*Sample Size*	*Control Limits Upper*	*Control Limits Lower*
1. *Dyeing vs printing*					
dry crocking					
vat dyes	4.317	4.096	360	4.134	4.058
prints	3.875	Vat Dyes significantly better.			
2. *Dyeing vs printing*					
wet crocking					
vat dyes	3.480	2.995	360	3.033	2.957
prints	2.509	Vat Dyes significantly better.			
3. *Vat dyes—type of application*					
dry crocking					
steam	4.067	4.317	60	4.409	4.225
Williams	4.375	Steam significantly poorer. Reduce significantly better.			
reduce	4.508				
4. *Vat dyes—type of application*					
wet crocking					
steam	3.242	3.481	60	3.573	3.389
Williams	3.700	Steam significantly poorer. Williams significantly better.			
reduce	3.500				
5. *Vat dyes—type prepare*					
dry crocking					
A	4.417				
B	4.242	4.317	60	4.409	4.227
C	4.292	A significantly better.			
6. *Vat dye—type prepare*					
wet crocking					
A	3.258				
B	3.558	3.480	60	3.572	3.388
C	3.625	A significantly poorer. C significantly better.			
7. *Prints—type of print*					
dry crocking					
pigment	4.000	3.875	60	3.967	3.783
azoic	3.842	Pigment significantly better. Vat borderline poorer.			
vat	3.783				
8. *Prints—type of print*					
wet crocking					
pigment	2.408	2.508	60	2.600	2.416
azoic	2.608	Pigment significantly poorer. Azoic significantly better.			
vat	2.508				
9. *Prints—type prepare*					
dry crocking					
A	3.875				
B	3.900	3.875	60	3.967	3.783
C	3.850	No significant differences.			
10. *Prints—type prepare*					
wet crocking					
A	2.442				
B	2.542	2.509	60	2.601	2.417
C	2.542	No significant differences			
11. *Naphthols—type prepare*	Significantly poorer than vats by inspection of the data in Table III without need of statistical analysis.				

was further investigated by statistical analysis of all the crock data from the experimental dyeings. Using the well-known control chart method *(16)*, the error variance was estimated from the average range of the five laboratories. This range was found to be 0.8299, resulting in a standard deviation of 0.501 for a single crock test. However, if a single observer rated the more than 2000 crocked samples the standard deviation for a single test was reduced to 0.357. For the large number of degrees of freedom involved, the difference is highly significant, demonstrating that there is a real difference among observers rating the same samples. Consequently all conclusions have been based on samples crocked at 5 laboratories, but finally rated by a single observer.

The uniformity of the crocking procedure at each laboratory was checked statistically, using the ratings of a single observer. All crock ratings for each laboratory were averaged and then compared with the grand average for all laboratories, using the control chart technique (see Table II).

Thus an average crock rating falling outside these control limits differs from the grand average with a probability of 95%.

It will be noted from Table II that laboratories 1 and 2 produced significantly higher crock ratings while those of laboratories 4 and 5 are significantly low. However, since the lack of control is symmetrically distributed, no gross error will result from the use of an average crock rating from all 5 laboratories.

In view of this symmetry, similar crock data for all five laboratories were averaged to three significant figures, as shown in Table III. This table summarizes and presents in composite form all of the crock data obtained from the laboratory dyeings.

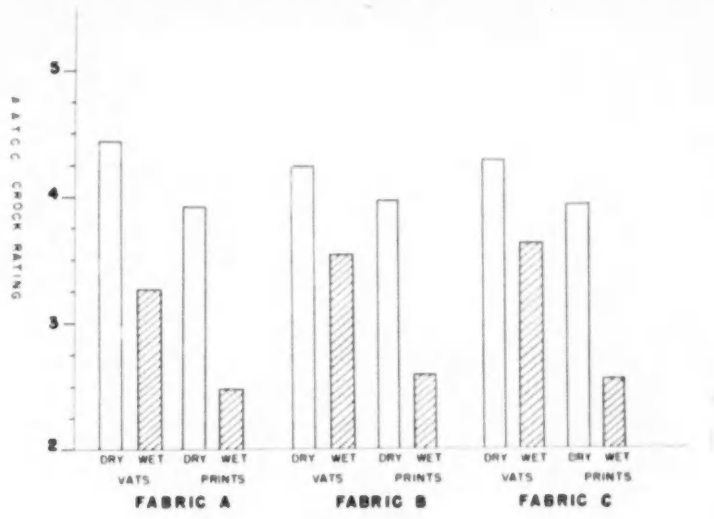

Figure 3

Effect on Crock Rating of Fabric Prepare

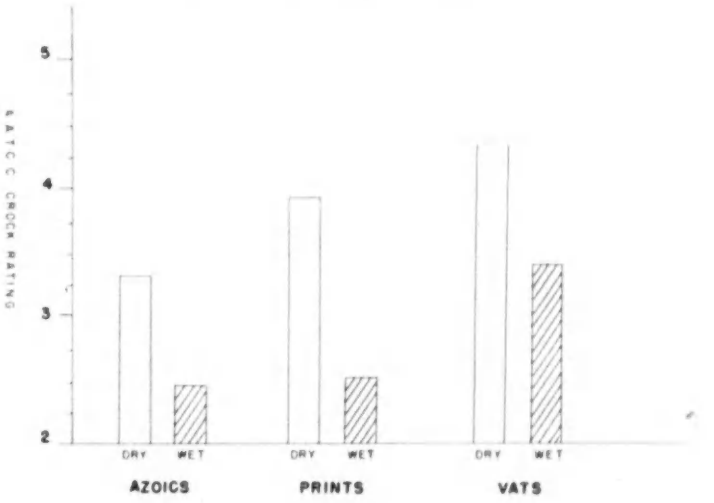

Figure 4

Crock Ratings of Dyes and Prints

CONCLUSIONS

As a means of presenting more readily the conclusions to be drawn from data in Table III, bar graphs have been prepared based on averages in the factors under consideration, and the significance of the differences have been analyzed statistically and summerized in Table IV.

The factors listed to the third decimal place were obtained by statistical analysis of the original individual crock ratings which were read to the nearest half step on the color transference chart.

DRY AND WET CROCKING——— It is readily apparent from Table III without graphical representation, that invariably the samples rate lower when crocked wet than when crocked dry. Although this has been generally accepted as true it is important to note that the data confirm this concept.

EFFECT OF DEGREE OF FABRIC PREPARATION———In Figure 3 crock levels are presented graphically for the three stages of fabric preparation, Fabric A, Fabric B and Fabric C, with respect to vat dyes and prints. The wet crockfastness of vat dyes is improved with superior preparation of the substrate. However, little effect is noted in the case of dry crockfastness of vat dyes and the wet and dry crockfastness of prints. Statistical analysis confirms these conclusions (Table IV).

EFFECT OF DYE TYPE——— The relative crockfastness of the three types of dyes used in this investigation and the effect of the manner in which they were applied are shown in Figure 4. The vat dyes rate the best and are significently higher than the prints in both dry and wet crocking. The prints in turn rate higher than the azoics used as shown in Figure 4.

EFFECT OF METHOD OF APPLICATION OF VAT DYES———The vat dyes were all applied by the same operation using the same padding technique. The strips padded with each color were then divided three ways and each strip fixed by a different method. Figure 5 illustrates

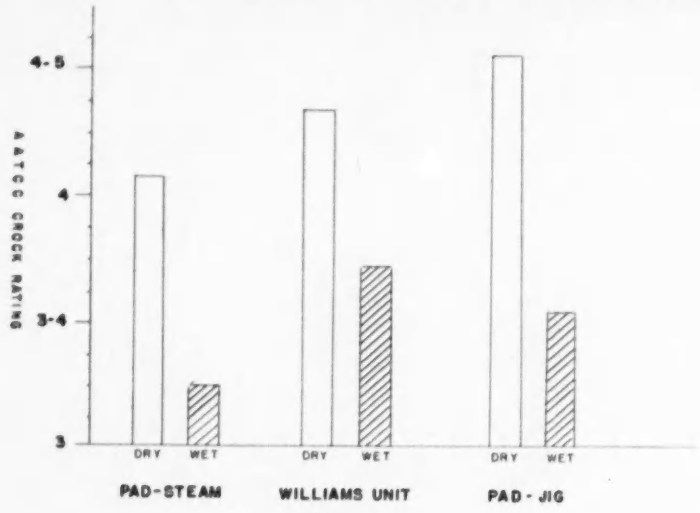

Figure 5

Crock Rating of Three Types of Vat Dyeings

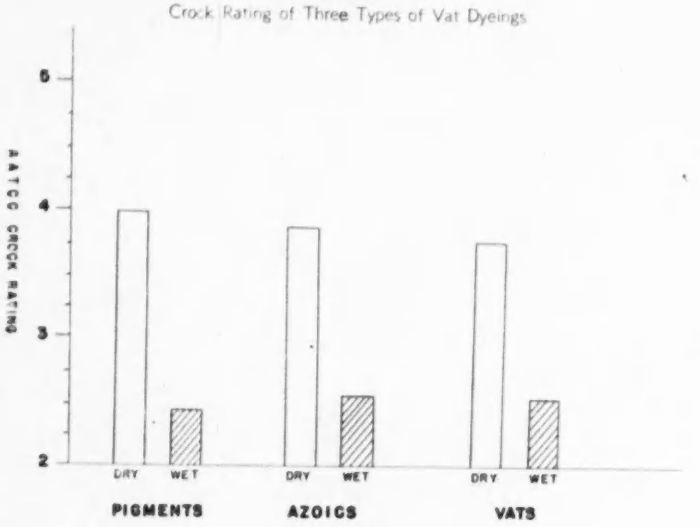

Figure 6

Relative Crock-Fastness of Prints

the relative crockfastness achieved by each method of development.

The statistical analysis indicates the Williams method to be significantly better to wet crocking and pad-jig method to be significantly better to dry crocking, while the pad-steam method is significantly poorer to both wet and dry crocking.

COMPARISON OF PRINT APPLICATIONS——It can be seen from Figure 6 that the relative crockfastness ratings of three types of printed colors as applied in this work show very little difference. However, these small differences are shown to be statistically significant although it must be questioned whether the differences have a practical significance.

TABLE V

EFFECT OF AFTERTREATMENTS ON COMMERCIALLY DYED SAMPLES

Sample	*Original*	*Scour*	*Latex*	*Silicone*	*Melamine-Formaldehyde*
Black, sulfur					
dry crock	4	4	4	3	4
wet crock	1	1	1	1	1
Maroon, naphthol					
dry crock	4	4-5	4-5	4	4
wet crock	3	2-3	2	2-3	2-3

EFFECT ON COMMERCIAL DYEINGS OF SELECTED AFTERTREATMENTS——The black sulfur-dyed fabric and the maroon naphthol-dyed fabric were both given various aftertreatments to study the effect on the crockfastness. Table V gives the composite crocking figure for the fabrics before and after these treatments.

It is apparent that the aftertreatments had no pronounced tendency to improve the crockfastness ratings of the fabric. In fact, the silicone aftertreatment appears to make the black sample crock to a slightly greater degree.

SUMMARY

These present investigations of crockfastness (1) have shown by a review of the literature that there are some available techniques for improving crockfastness, but there has been no general solution to the problem; (2) have brought out the fact that there are adequate and reproducible methods for measuring and rating the degree of crocking; (3) have demonstrated that crocking is largely a problem involving unfixed surface dye; (4) have shown that crocking is diminished by processes which tend to give better penetration of the dye into the fiber, such as better preparation of the material before dyeing; and (5) have borne out the complexity of the problem by showing that each class of dye and method of application presents its own problem and lastly indicates the necessity for further intensive work on the many phases of a difficult problem.

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1954 Intersectional Contest——

FACTORS AFFECTING TINT REMOVAL FROM STAPLE FIBERS*

PHILADELPHIA SECTION

Paul L Speakman

COMMITTEE

Paul L Speakman, *Chairman*
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(See page P48 for a complete list of all the members who devoted their time and effort to produce this paper for the Philadelphia Section.)

Robert J Thomas

The increasing variety of fiber blends, which are being produced as a result of the introduction of so many new synthetic fibers, has necessitated, more than ever, the use of tints to identify the various components of the fabric. As with the natural and the older synthetic fibers, the dyer is faced with the problem of tint removal. However, the advent of the new synthetic fibers has been accompanied by the development of new processing operations or by the modification of old ones. The problem of tint removal is complicated by the tendency of these processing operations to fix many dyes and pigments in the fibers.

In the present study, a preliminary survey has been made of the effect of such processing operations as heat setting, crimp setting, can drying (slashing) and aging, as well as of the scouring conditions, on the efficiency of tint removal from twelve staple fibers. It has been shown that some of the tints used on the older fibers may be used on the new fibers but their removal from all fibers is generally made more difficult by exposure to high-temperature processing operations and is facilitated by increasing the temperature and, where feasible, the pH of the scouring liquor.

I INTRODUCTION

DURING the past fifteen years the textile industry has witnessed the introduction of many new fibers. The first of these, nylon, after its displacement of silk in the full-fashioned hosiery field, soon became accepted in staple form where, because of its high tenacity and high abrasion resistance, it proved of value for blending with wool and with rayon. "Dacron" polyester fiber with its dimensional stability, crease retention and wrinkle resistance, and the acrylics with their bulkiness, resilience and hand are rapidly becoming established. Still other fibers are in pilot-plant production and unquestionably others are yet to come.

It is but a natural consequence that designers would try to develop for particular end uses superior fabrics having the outstanding inherent properties of certain of the new fibers, as well as the desirable properties of certain of the older synthetic or natural fibers, by blending the respective fibers. The increasing variety of such blends has necessitated more than ever the use of tints to identify the different yarns which are being processed.

As with the natural and older synthetic fibers, the dyer is now faced with the problem of tint removal from the new fibers and their blends. The advent of the new fibers has been accompanied by the development of new processing operations, as well as by the modification of older ones. Hence, the problem of tint removal is complicated by the tendency of these processing operations to fix in some of the fibers many dyes and pigments applied as fugitive tints. The significance of this problem has been stressed by Goldberg *(1)*. It is, therefore, a purpose of this paper to direct attention to conditions which are likely to cause tints on particular fibers to become nonfugitive. Another purpose is to illustrate the effect of variations in scouring conditions on the removal of tints from the different fibers.

* Presented by Robert J Thomas at Atlanta, Ga, on Sept 19, 1954.

II EXPERIMENTAL

Fibers

In commercial practice tints are normally applied from either aqueous or oil media to rawstock, top or yarn. A study of the identification tinting of acetate staple, wool and viscose staple in relation to each other wherein the tints were applied to stock has recently been reported *(2)*. However, to apply several different tints to the many different commercial staple fibers and then to convert the tinted items to woven fabric presented a task which was obviously too cumbersome and too costly to be undertaken as a project by the Committee. Therefore, the idea of weaving a fabric with a warp composed of several ends of yarns of each of the individual fibers and with a filling of a single, relatively nonabsorptive fiber was conceived. A tint could then be applied to all of the test fibers simultaneously by padding. In addition, when such a tinted fabric was scoured, the relative removability of particular tints from the different fibers would be readily evident and transfer of tint from one fiber to another during scouring, if it occurred, might also be apparent.

Accordingly, staple yarns of the following fibers were procured:

cotton
acetate
viscose
silk
wool

"Vicara" protein fiber
nylon
"Dacron" polyester fiber
"Acrilan" acrylic fiber
"Orlon" Type 42 acrylic fiber
"Dynel" acrylic fiber

These yarns were of approximately the same size, a 30/2's cc (see Appendix A). At the time of weaving the fabric, staple yarns of "Saran" vinylidene chloride fiber in the yarn count desired were not available so a continuous filament yarn was included. The warp consisted of successive groups of ends of each of the above fibers in the order listed, 96 ends per inch, and the filling was 200-denier "Orlon" Type 81 acrylic fiber, 50 picks per inch. In weaving, no size was used. A 4/1 satin construction was selected since it would facilitate inspection of the warp yarns.

Since it was anticipated that difficulties would be encountered and would necessitate additional experiments separately on certain fibers, tapes of each fiber were also woven.

The multifiber fabric was scoured by passing three times through a crab in a liquor at 180°F containing 0.6 g/l "Duponol" RA surface-active agent and 0.2 g/l tetrasodium pyrophosphate, and was rinsed in water at 110°F. The fabric was then framed and dried at 200°F.

Selection of Tints

There are on the market and in use numerous proprietary fugitive tinting materials, which are generally mixtures of dyes and chemicals of undisclosed composition. Each manufacturer has his own formulations, which he believes to be best. As it is not the purpose of this paper to judge which may be the best available among proprietary tints, but rather to contribute to the knowledge about tints on fiber blends, it was decided that individual, known dyes and pigments be used in this investigation.

Common practice in the application of tinting materials involves the use of either aqueous or oil media. A survey of prevailing practice among fiber processors indicated that the use of aqueous media predominated. Furthermore, the oil-soluble dyes are chemically the same as, or similar to, the disperse dyes which have appreciable affinity for many of the new fibers. For these reasons, it was decided to limit the present study to the application of tints from aqueous media.

Experience by processors of the natural and older synthetic fibers has indicated that certain dyes and pigments are useful as tints. Literature concerning those products, their application and removal has from time to time been disseminated by various vendors. Hence, it was possible to select dyes and pigments which were suitable for tinting some of the fibers and which could be removed after the fiber had been subjected to required processing conditions. Accordingly, four dyes and three pigments were selected. These were applied by padding from water solution or dispersion at *110°F* at the following concentrations:

Dyes

0.5 g/l Tartrazine (CI 640)
0.5 g/l Amido Naphthol Red 6B (CI 57)
0.5 g/l Indigotin IA (CI 1180)
0.5 g/l Wool Green S (CI 737)

Pigments

4.0 g/l Algol Yellow GC (Pr 9)
4.0 g/l Helindon Pink R Extra (Pr 109)
2.0 g/l Copper Phthalocyanine Blue (Pr 481)

No assistants were incorporated in any of the pad liquors, since a study of the effect of auxiliaries was not considered within the scope of the Committee's investigation.

A squeeze which would normally yield a pickup of 70 percent on 8.2-ounce cotton twill was employed. The fabric was batched on a roll and within a few minutes, was dried on a pin tenter at 130°-150°F. This low drying temperature was selected to avoid any fixation of any of the tints prior to subjecting the fabric to the processing conditions to be studied.

As an untinted control in subsequent experiments, a length of the scoured multifiber fabric was padded through water only and dried as above.

Tests on Multifiber Fabric

PROCESSING CONDITIONS ——— From the time a tint is applied to the fiber until the woven fabric is prepared for dyeing, there are many processing operations or conditions to which the fiber may be subjected. The conditions may affect the fixation of the tint in the fiber and, conversely, the ease of removal when the fabric is prepared for dyeing. In this investigation the multifiber fabric, untinted and tinted, was subjected to the following processing conditions:

1) Not processed, retained as control.
2) Heat-setting in hot air for 18 seconds at 420°F.
3) Crimp-setting in an atmosphere of steam for 15 minutes at 30 psig.
4) Can-drying over five cans for a total time of 65 seconds at 230°F. (This was to simulate conditions actually somewhat more severe than would be encountered in warp slashing.)
5) Aging for four hours at 180°F dry bulb, 170°F wet bulb, corresponding to about 80% RH. (This test was intended to simulate what might occur if the tinted fiber were allowed to stand for a considerable period of time, eg, several weeks, before scouring without being subjected to any of the foregoing operations.)

It is recognized that not all fibers would normally be subjected to some of these treatments and, in fact, certain fibers would be damaged or degraded to the point where an unsatisfactory fabric would result. Specific cases will be pointed out later in this paper.

SCOURING METHODS ——— The number of formulations used to scour fabrics prior to dyeing is almost as great as the number of dyers. Many different detergents are used and often alkalies, builders, etc, are used in conjunction therewith. Three different detergents were utilized in the present study: a low titer soap, a fatty alcohol sulfate, and an alkylarylpolyether alcohol. Since some tints might be readily removed at low scouring temperatures, might actually be fixed at more elevated temperatures, or might transfer from one fiber to another, it was necessary to consider the influence of scouring temperature on the degree of removal of each tint from the respective fibers. Segments of the multifiber fabric with each tint were scoured under the different detergent-pH conditions described below at 80°, 150° and 205°F, respectively. Also, the pH of the scouring liquor could influence the removal, and hence, with the synthetic detergents, scouring was carried out at two different pH values. Conditions employed with each detergent follow:

5.0 g/l soap ("Olate" Flakes) at pH 10.4-10.6
1.0 g/l "Duponol" D Paste at pH 6.9-7.1 and at pH 10.4-10.6
0.5 g/l "Triton" X-100 at pH 6.9-7.1 and at pH 10.4-10.6.

The initial pH values were measured with a pH meter and adjusted by the addition of acetic acid or soda ash solution, as required. A 30:1 ratio was used in the bath, which was raised in 15 minutes to the required temperature at which treatment was continued for 30 minutes. After being scoured, the fabric was rinsed thoroughly with warm water and dried in air at room temperature.

Appraisal of Results

The results were appraised in three categories:

1) Tinctorial strength of the tint on each fiber as applied and after subjecting to the particular processing conditions;
2) Effect of the processing and scouring conditions on the physical properties of each fiber; and
3) Degree of removal of the tints from the variously processed fibers by the different scouring procedures.

TINCTORIAL STRENGTH EFFECTED WITH TINTS———It was immedi-

TABLE I

TINCTORIAL STRENGTH OR COLORATION OF TINTS AFTER VARIOUS HEAT TREATMENTS

(Ratings made using AATCC Chart for Measuring Transference of Color)

Tint	*Treatment*	*cotton*	*acetate*	*viscose*	*silk*	*wool*	*"Vicara"*	*nylon*	*"Dacron"*	*"Acrilan"*	*"Orlon" Type 42*	*"Dynel"*	*"Saran"*
Control (untinted)	control	5	5	5	3-4	3-4	4	5	5	4	5	3	4
	heat-set	5	5	5	3-4	3-4	4	5	5	4	5	D	D
	steam-set	5	D	5	3-4	3-4	4	5	5	4	5	D	D
	can-dried	5	5	5	3-4	3-4	4	5	5	4	5	3	4
	aged	5	5	5	3-4	3-4	4	4-5	5	4	5	3	4
Tartrazine (CI 640)	control	1	4	1	3	4	3	4-5	4-5	4	4	4-5	4-5
	heat-set	1	4	1	3	4	3	4	4	4	4	D	D
	steam-set	1	D	1	3	3	2	3	4-5	3	4	D	D
	can-dried	1	4	1	3	4	3	4-5	4-5	4	4	4-5	4-5
	aged	1	4	1	3	4	3	3	4-5	4	4	4-5	4-5
Amido Naphthol Red 6B (CI 57)	control	1	3	1	2	3	3	2-3	4	4	3	4	4
	heat-set	1	3	1	2	3	3	2	4	4	3	D	D
	steam-set	1	D	1	2	3	1	1	4	1	2	D	D
	can-dried	1	3	1	2	3	3	2-3	4	4	3	4	4
	aged	1	3SC	1	2	3	3SC	2	3SC	3SC	3SC	4SC	4SC
Indigotin IA (CI 1180)	control	1	4-5	1	4	4	4	4	4	4	4	4-5	4
	heat-set	1	4-5	1	4	4	4	4	4	4	4	D	D
	steam-set	1	D	1	3	3	2	2	4	2	3	D	D
	can-dried	1	4-5	1	4	4	4	4	4	4	4	4-5	4
	aged	1	4	1	3	3	3	3	4	4	3	4	4
Wool Green S (CI 737)	control	1	3	2	2	3	2	4	4	3	3	3	4
	heat-set	1	3	2	2	3	2	4	4	3	3	D	D
	steam-set	1	D	1-2	1-2	2	1-2	3	4	2	2	D	D
	can-dried	1	2-3	1-2	1-2	3	2	4	4	3	2-3	3	4
	aged	1	3	2	2	3	2	4	4	2-3	2-3	2-3	4
Algol Yellow GC (Pr 9)	control	3	3	3	4	4	3	3	4	3	3-4	4	4
	heat-set	3	3	3	4	4	2	3	3	2	3	D	D
	steam-set	3	D	3	3	3	1	3	3	2	2	D	D
	can-dried	3	3	3	4	4	3	3	4	3	3-4	4	4
	aged	2-3	2-3	3	3	3	1	3	3	2	2	3-4	3-4
Helindon Pink R Extra (Pr 109)	control	2	3	2	2	2	2	2	2	2	2	2	2
	heat-set	2	3	2	2	2	2	1	1	2	2	D	D
	steam-set	2	D	2	2	2	2	2	2	2	2	D	D
	can-dried	2	3	2	2	2	2	2	2	2	2	2	2
	aged	2	3	2	2	2	2	2	2	2	2	2	2
Copper Phthalocyanine Blue (Pr 481)	control	2	1	1	1	2	2	2	3	1	1	3	3
	heat-set	1	1	1	2	2	1	2	3	1	1	D	D
	steam-set	2	D	1	2	2	2	2	3	2	2	D	D
	can-dried	2	2	1	2	2	2	2	3	1	1	3	3
	aged	2	1	1	1	2	2	2	3	1	1	3	3

D—fiber damaged
SC—shade changed

ately evident that an extremely wide range of depths was obtained on the different fibers with each dye or pigment. Certain fibers, such as cotton and viscose, were heavily colored; other fibers, mostly the hydrophobics, were tinted comparatively lightly. To rate these tinctorial differences among the various fibers and dyes, the AATCC Chart for Measuring Transference of Color was selected as the standard.

Accordingly, the numerals used in the subsequent tables to signify the tinctorial strength of the tinted fiber or the residual coloration after scouring denote:

5—negligible coloration
4-5—trace coloration
4—noticeable coloration
3—appreciable coloration
2—considerable coloration
1—much coloration

In Table I, tinctorial strength ratings of the different tints after application to the multifiber fabric and after subjection to the various processing conditions are presented for all of the fibers. Also included in Table I are ratings which describe the natural coloration of and the color changes due to processing the untinted fiber. Allowance for this natural coloration was made in rating the effectiveness of different tints on the same fiber for the same processing conditions. This allowance caused the apparent anomaly of certain fibers having a lower tinctorial rating when tinted with some dyes than when not tinted.

In order to be satisfactory from the standpoint of tinctorial depth, it was decided that a tint would have to rate less than "4", for a rating of "4" or higher represented a tint depth too slight to be useful for identification purposes. Those fibers which were obviously damaged by particular processing conditions were not rated for tinctorial strength and are designated in Table I with a "D". Also, whenever a marked change in hue of a tint was observed, the notation "SC" was included with the tinctorial strength rating.

Because some of the synthetic fibers exhibited a low order of coloration when the tints, especially the water-soluble dyes, were applied to the multifiber fabric, tapes of nylon, "Dacron", "Acrilan", "Orlon" Type 42, "Dynel" and "Saran", respectively, were padded with an aqueous solution containing a tenfold increase in the concentration of the water-soluble dyes which had been applied to the multifiber fabric. The thusly tinted tapes were not used to affect the ratings in Table I but were employed subsequently to obtain confirmatory data in the study of the effects of processing operations and scouring conditions on the fixation and removal of tints.

EFFECT OF TREATMENTS ON FIBER PHYSICAL PROPERTIES——*Processing Conditions.* The four operations studied were conducted under conditions similar to those which are ordinarily used in processing several components of the multifiber fabric. However, these conditions were too drastic for some of the other fibers, and, of course, would not be recommended in their normal processing. To technical personnel handling fabrics containing fibers which are benefited by specific processes, as well as fibers adversely affected by such processes, data developed in this investigation as to the effect of the processing conditions on certain fibers will be of considerable interest.

From the tests on the multifiber fabric, it was evident that "Dynel" and "Saran"

TABLE II

EFFECT OF PROCESSING CONDITIONS ON PHYSICAL PROPERTIES OF ACETATE, "DYNEL" AND "SARAN"

Fiber	processing treatment	tensile strength: no. of tests	tensile strength: average lb	approx shrinkage in width	change in hand
acetate	control	10	39.6		
	heat-set	10	43.0	none	none
	steam-set	10	21.8	none	stiffer
"Dynel"	control	10	68.5		
	heat-set	10	56.7	40%	much stiffer, brittle
	steam-set	8	35.0	25%	stiffer
"Saran"	control	3	88.8		
	heat-set	10	46.7	25%	stiffer
	steam-set	4	76.5	25%	negligible

had become very stiff on heat setting and on steam setting. The acetate in this fabric did not appear to be significantly affected by heat setting but did become stiff as a result of the crimp-setting operation. In view of this, tests were carried out on tapes woven from these individual thermally sensitive fibers. The appraisal of the effect of heat setting and of steam-setting or crimp-setting on the tensile strength, shrinkage and hand of these fibers appears in Table II.

These results convincingly point to the hazard of subjecting materials containing "Dynel" and/or "Saran" to heat-setting and those containing these fibers and/or acetate to crimp-setting operations. It should be kept in mind, however, that the conditions employed in the present study were relatively severe. If less severe conditions could be used effectively, it is possible that in some constructions these fibers might escape serious damage.

As a further confirmation that acetate was not deacetylated by the heat-setting conditions employed, attempts were made to dye the heat-set tape with Diamine Sky Blue FF (CI 518) but no staining was evident.

Scouring Conditions. Although it was recognized that the high temperature and the high pH of certain of the scouring treatments employed in the survey on the multifiber fabric would be detrimental to some of the fibers, these conditions were nevertheless included because they could conceivably promote tint removal from other fibers. As a matter of fact, the high temperature and high pH were particularly effective in removing tints from many of the synthetic fibers.

In the course of this phase of the work, the report of Mauer and Wechsler *(3)* that "Vicara" can tolerate strong caustic solutions was questioned in view of the yellowing which this fiber underwent on scouring in alkaline media at 205°F. Tests carried out on tapes of "Vicara", as reported in Table III, however, indicated only a moderate tensile strength loss and relatively slight yellowing on scouring this fiber for 30 minutes at 205°F in baths having the pH initially adjusted either at 10.5 or 7.0. Hence, the more severe yellowing that was observed on the multifiber fabric was attributed to staining by decomposition products from the adjacent wool fiber. Accordingly, tint removal data from "Vicara" under the alkaline scouring conditions have been included in the tables of Appendix B.

On the other hand, as would be expected, wool was severely yellowed on scouring at 205°F at pH 10.5 and ratings for tint removal from it under these conditions have been omitted.

There was some question as to the possible saponification of acetate fiber on subjection to alkaline scours at 205°F. To check this point, tapes of acetate were scoured for 30 minutes at 205°F under the conditions indicated below and, after rinsing, were treated for 10 minutes at 180°F in a dyebath of Diamine Sky Blue FF (CI 518). The degree of coloration attained on the thusly treated tapes is as follows:

Scouring Liquor: Detergent	pH: start	pH: 30 minutes	Staining: Diamine Sky Blue FF
soap	10.5	10.3	3-4
"Duponol" D Paste	7.1	7.0	5
	10.5	8.8	4-5
"Triton" X-100	7.1	7.0	5
	10.5	8.8	4-5

In baths of the synthetic detergents initially at pH 10.5, a significant pH drop occurred, whereas the pH of the soap liquor changed only slightly. Direct dye absorption by the acetate scoured with soap at 205°F definitely indicated partial saponification. Nevertheless, tint removal from acetate as a result of such a scour was rated, for conceivably under certain conditions partial saponification might be acceptable.

TABLE III

EFFECT OF SCOURING ON PROPERTIES OF "VICARA"

(Scoured 30 minutes at 205°F)

Detergent	pH (initial)	tensile strength (lb)	color vs control
control	—	37.7	—
soap	10.5	33.5	4Y*
"Duponol" D Paste	7.0	32.9	5
	10.5	31.5	4-5Y*
"Triton" X-100	7.0	32.5	5
	10.5	30.2	4-5Y*

* Y—yellower

TINT REMOVAL ——— Since a total of some 7200 ratings appear in the tables of Appendix B, the significance of these data, as well as those of Table I, is summarized in Table IV. The criteria on which the latter table was based follow:

1) *Tinctorial value on fiber*: A rating of less than "4" when applied at the concentrations used on the multifiber fabric was considered desirable, although it was recognized that heavier concentrations would be employed on those fibers which were only lightly tinted.

2) *Removability from fiber*: Greater residual color than would be denoted by a rating after scouring of less than "4" was considered at least undesirable, if not unacceptable.

3) *Optimum scouring conditions*: If a particular detergent, pH or temperature was most effective in removing the preferred tints from the different fibers, it is indicated; otherwise, the word "all" is used to signify that any of the conditions would suffice.

From Table IV it is readily apparent that the hydrophilic fibers present no difficulty insofar as one is concerned with tinting to a sufficient tinctorial depth. Attainment of adequate tinctorial strength was, of course, to some degree, more of a problem with the so-called hydrophobic fibers, especially with reference to the water-soluble dyes. In regard to removability, the unsatisfactory behavior of pigments was evident with all fibers. Although the pigments were generally significantly superior to the water-soluble dyes in attaining adequate coloration on the hydrophobic fibers (as well as on the hydrophilic fibers), their difficult removability obviates recommending their general use.

As indicated previously, certain of the hydrophobic fibers were separately tinted (as woven tapes) with ten times the concentration of the water-soluble dyes ap-

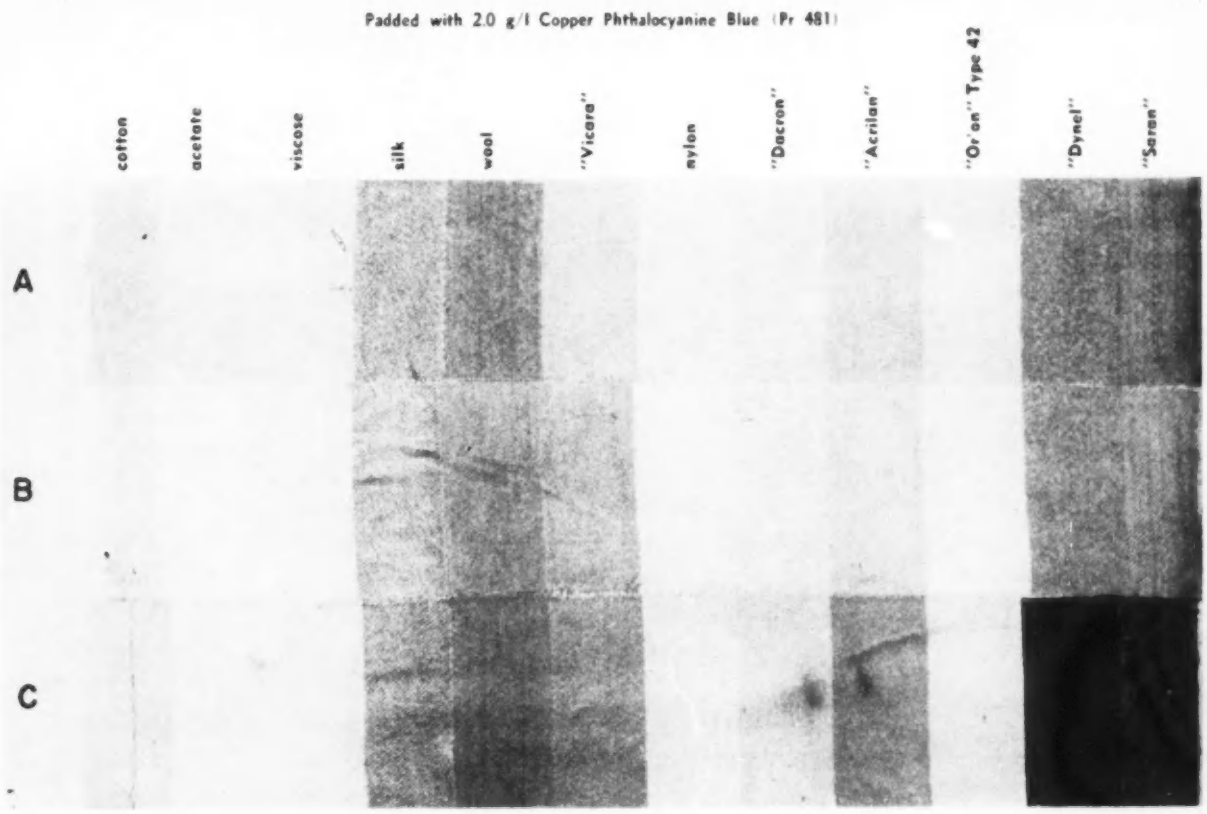

Figure 1

A——Dried at 100°F.
B——As "A"—Then scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5.
C——As "A"—Then heat set 18 sec at 420°F, scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5.

TABLE IV
SUMMARIZED OBSERVATIONS RELATIVE TO APPLICATION AND REMOVAL OF TINTS

Fiber	*preferred tints** tinctorial value	removability	*optimum scouring conditions* detergent	pH	Temp (°F)	remarks
cotton	all	D-A-C-B	all	10.5	205	
acetate	C-D-E-F-G	C-D	"Triton" X-100	7.0	150	"D" fixed on steam setting.
viscose	all	A-C-B-D	all	all	all	
silk	all	C-A-B-D	all	10.5	205	
wool	all	A-B-C	soap	10.5	150	"A" fixed on steam setting and heat setting; "B" and "C" weak tinctorially; neutral high-temperature scours cause dyeing.
"Vicara"	all	C-B-D	soap	10.5	205	"B" and "D" less completely removed after steam setting.
nylon	B-E-F-G	B	all	10.5	205	"A", "C" and "D" exhibited good tinctorial value when steam set.
"Dacron"	none	B-D-C-A	all	all	all	Removability judged from tests on tapes.
"Acrilan"	D-E-F-G	D	all	10.5	205	"D" fixed on heat setting and steam setting.
"Orlon" Type 42	B-D-E-F-G	B-D	all	all	205	"B" and "D" fixed on steam setting; "D" on heat setting.
"Dynel"	D-F-G	D	all	all	205	"D" fixed on steam setting and heat setting.
"Saran"	F-G	A-B-C-D	all	all	all	"A", "B", "C" and "D" were weak tinctorially although their removability was good as judged from tests on tapes.

* The letters used denoted: A—Tartrazine (CI 640)
B—Amido Naphthol Red 6B (CI 57)
C—Indigotin IA (CI 1180)
D—Wool Green S (CI 737)
E—Algol Yellow GC (Pr 9)
F—Helindon Pink R Extra (Pr 109)
G—Copper Phthalocyanine Blue (Pr 481)

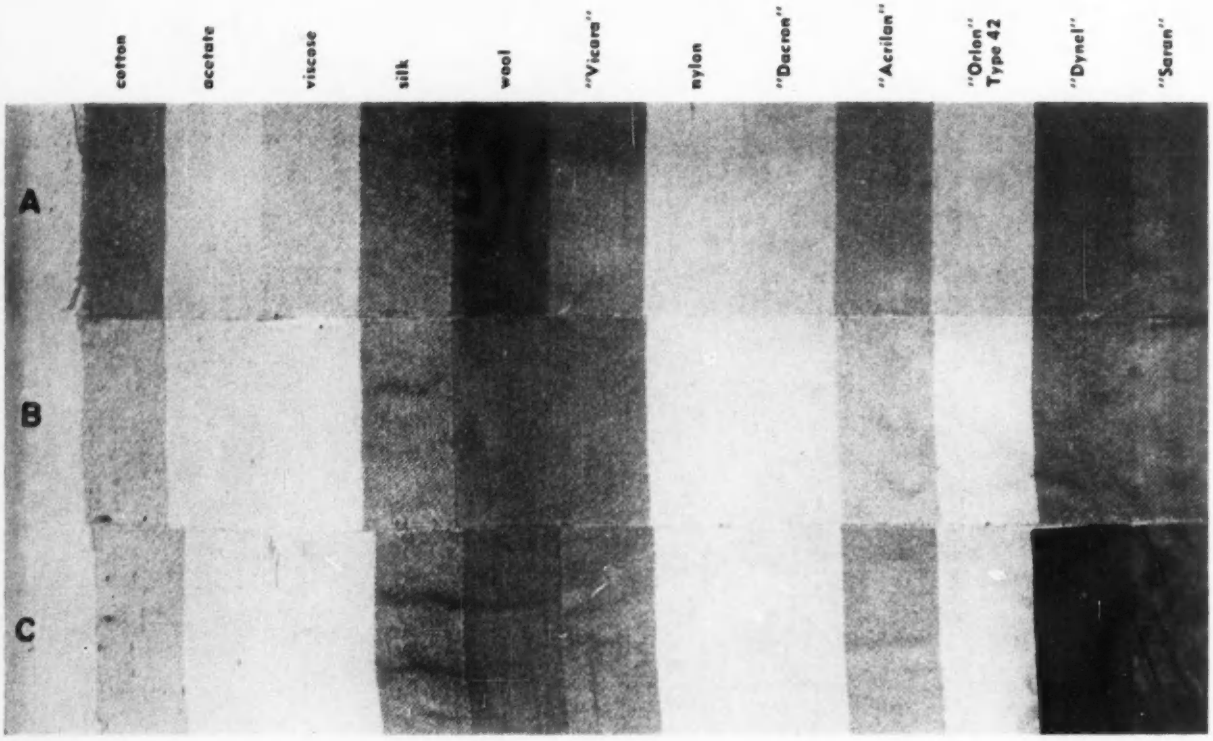

Figure 2

A——Dried at 100°F
B——As "A"—Then scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5
C——As "A"—Then heat set 18 sec at 420°F, scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5

plied to the multifiber fabric. Thus, at least an acceptable tinctorial depth was obtained on all fibers. After these tapes had been subjected to the different processing operations and the different scouring treatments, tint removal was rated and, in general, confirmed the rating which resulted on inspection of the fiber in the similarly processed and scoured multifiber fabric.

III SUMMARY

A critical study of the tables in Appendix B gives an insight as to the effect of the different processing operations on the removability of the tints from the various fibers. Salient points are summarized here.

Influence of Processing Operations

1) *Unprocessed*: All of the four acid dyes used in this investigation were removed from all of the fibers by one or more of the scouring methods employed, although some difficulty as to removability was observed with Amido Naphthol Red 6B on cotton, wool and nylon and with Wool Green S on wool and nylon. All of the pigments were more difficult to remove from each of the fibers than were the water-soluble dyes. In fact, even without having been subjected to any of the processing operations, their removability by means of any of the scouring methods used was unsatisfactory (see Figures 1-3). This difficulty was most pronounced in the case of Algol Yellow GC.

2) *Heat Setting*: As a result of this operation, removal of Tartrazine, Amido Naphthol Red 6B and Wool Green S from nylon became somewhat more difficult. Both "Acrilan" and "Orlon" Type 42 acrylic fibers retained Wool Green S (see Figure 2). Also, after heat-setting, the Amido Naphthol Red 6B was more difficult to remove from the "Acrilan" and to a lesser degree from the "Orlon" Type 42. However, heat-setting had no significant effect on the retention of Indigotin IA by any of the fibers.

3) *Crimp Setting or Steam Setting*: This operation was the most serious of those evaluated insofar as tending to fix tints. Removal of Amido Naphthol Red 6B and Wool Green S from wool, "Vicara", nylon, "Acrilan" and "Orlon" Type 42 became much more difficult. Also, Tartrazine, while still very readily removed from "Orlon" Type 42, was especially difficult to remove from nylon. It left wool, "Vicara" and "Acrilan" heavily stained, regardless of the scouring methods employed. Even Indigotin IA, which for the most part was unaffected on all fibers by heat setting, became very difficult to remove from many of the fibers and was essentially nonremovable from "Acrilan" by all of the scouring methods employed.

4) *Can Drying*: Although this operation was carried out at a fairly high temperature and for a relatively long contact time as compared with commercial practice, little effect on tint retention by any fiber was evident.

5) *Aging (Accelerated Storage)*: Inhibition of the removal of Wool Green S from wool, "Vicara", nylon, "Acrilan" and "Dynel", and Amido Naphthol Red 6B from nylon and to a lesser degree from "Vicara" resulted (see Figure 3). However, the fixation of Tartrazine and Indigotin IA was not significantly affected.

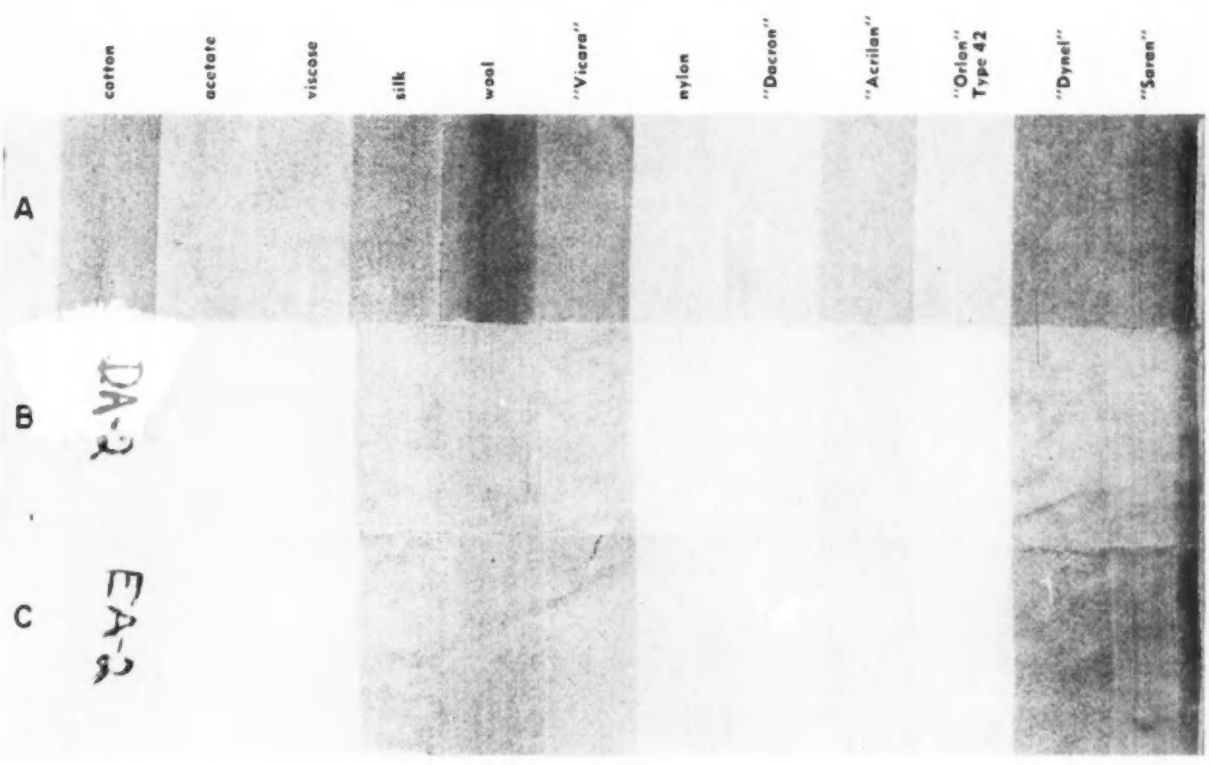

Figure 3

A——Dried at 100°F
B——As "A"—Then scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5
C——As "A"—Then accelerated storage test 14 hours at 180°F and 90% RH, Scoured 30 min at 150°F with 5.0 g/l soap at pH 10.5

Influence of Scouring Conditions

A study of the tables in Appendix B also provides an analysis of the effect of different scouring conditions. In general, the different detergents employed were more or less equally effective, although soap, which was used at a higher concentration than the synthetic detergents, accomplished slightly better removal in a few instances. Where alkaline, high-temperature scours could be used, they usually produced most satisfactory removal. However, it is apparent from these data that the optimum scouring conditions will vary with the fiber, the tint and the processing conditions to which the tinted fiber has been subjected.

IV REFERENCES

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(3) Mauer, L, and Wechsler, H, p42, "Man-Made Fibers", Rayon Publishing Corporation, New York (1953).

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Dixie Mercerizing Co
E I du Pont de Nemours and Company, Inc
Geigy Co, Inc
Glasgo Ltd, Inc
Globe Dye Works Co
Hart Products Corp
Hellwig Dyeing Corp
James Lees & Sons Co
Moss Rose Manufacturing Co
National Aniline Div
North American Lace Co
Philadelphia Textile Institute (Prof T R Foltz)
Poplar Textiles, Inc
Rohm and Haas Co
Saran Yarns Co
Scholler Bros, Inc
Virginia-Carolina Chemical Corp

VI TRADEMARKS

Acrilan ——— Chemstrand Corporation's acrylic fiber
Dacron———E I du Pont de Nemours & Company's polyester fiber
Duponol———E I du Pont de Nemours & Company's long-chain alcohol sulfate
Dynel———Union Carbide and Carbon Corporation's acrylic fiber
Olate ——— Procter and Gamble Company's technical sodium oleate
Orlon———E I du Pont de Nemours & Company's acrylic fiber
Saran ——— Saran Yarns Company's vinylidine chloride fiber
Triton———Rohm & Haas Company's alkylarylpolyether alcohol
Vicara ——— Virginia-Carolina Chemical Company's protein fiber

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APPENDIX A

Construction of Multifiber Fabric

Weave: 4/1 satin

Warp: (96 ends per inch)

Ends	*Cotton Count*	
96	30's/2	cotton
96	24's/2	acetate
96	30's/2	viscose rayon
96	30's/2	silk
96	30's/2	wool
96	30's/2	"Vicara" protein fiber
96	30's/2	nylon
96	30's/2	"Dacron" polyester fiber
96	30's/2	"Acrilan" acrylic fiber
96	30's/2	"Orlon" Type 42 acrylic fiber
96	30's/2	"Dynel" acrylic fiber
96	600-denier	"Saran" vinylidene chloride fiber

Filling: 50 picks per inch 200-denier "Orlon" Type 81

The above warp groupings were repeated four times across the fabric.

APPENDIX B

TABLE A—APPENDIX B
COLORATION OF UNTINTED FIBERS AFTER VARIOUS PROCESSING AND SCOURING TREATMENTS

Processing Treatment	Scour	Cotton			Acetate			Viscose			Silk			Wool			"Vicara"			Nylon			"Dacron"			"Acrilan"			"Orlon" Type 42			"Dynel"			"Saran"		
		Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.		
		80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205
Control	Soap	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	4–5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Duponol" D Paste																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	4–5	X	5	5	4	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	4–5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	4–5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Heat Set	Soap	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	4–5	4	5	5	5	5	5	5	5	5	5	5	5	D	D	D	D	D	D	D
	"Duponol" D Paste																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	5	5	5	5	5	5	5	5	5	5	5	5	D	D	D	D	D	D	D
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	4–5	3–4	X	5	4	4	5	5	4	5	5	5	5	5	5	5	5	D	D	D	D	D	D	D
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	5	5	5	4–5	5	5	5	5	5	5	5	5	D	D	D	D	D	D	D
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	D	D	D	D	D	D	D

Steam Set	Soap	5	5	5	D	D	D	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	D	D	D	D	D	D
	"Duponol" D Paste																																		
	Neutral	5	5	5	D	D	D	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	D	D	D	D	D	D
	Alkaline	5	5	5	D	D	D	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	D	D	D	D	D	D
	"Triton" X-100																																		
	Neutral	5	5	5	D	D	D	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4	5	5	5	5	5	5	5	D	D	D	D	D	D
	Alkaline	5	5	5	D	D	D	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4	5	5	5	5	5	5	5	D	D	D	D	D	D
Can Dried	Soap	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Duponol" D Paste																																		
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	4	X	5	4	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Triton" X-100																																		
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	4	X	5	4	4	5	4–5	4	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	4	X	5	4	4	5	4–5	4	5	5	5	5	5	5	5	5	5	5	5	5	5
Aged	Soap	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Duponol" D Paste																																		
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	4–5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	4–5	X	5	5	4	5	5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Triton" X-100																																		
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	5	X	5	5	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

TABLE B—APPENDIX B
REMOVAL OF TARTRAZINE (CI 640) EFFECTED BY VARIOUS SCOURING CONDITIONS

		Residual Tint on Fibers																																	
		Cotton			Acetate			Viscose			Silk			Wool			"Vicara"			Nylon			"Dacron"			"Acrilan"			"Orlon" T-42			"Dynel"			"Saran"		
Processing Treatment	Scour	Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.		
		80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205
Control	Soap	5	5	5	5	5	5	5	5	5	5	5	5	5	4	X	5	4	4	5	5	4–5	5	5	5	5	5	5	5	5	4–5	5	5	5	4–5	5	5
	"Duponol" D Paste																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	4–5	4	3	5	4–5	3–4	4	4	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	5	4	X	5	3	3–4	5	5	4–5	5	5	5	5	5	5	5	5	4–5	5	5	5	4–5	5	5
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	4–5	3–4	1	5	5	4	4–5	4–5	4–5	5	5	5	5	5	4–5	5	5	5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	4–5	3–4	X	5	3–4	3–4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Heat Set	Soap	5	5	5	5	5	5	5	5	5	4–5	4–5	5	4–5	3	X	5	3	3–4	4	4–5	5	5	5	5	5	5	5	4–5	4–5	4–5	D	D	D	D	D	D
	"Duponol" D Paste																																				
	Neutral	4–5	4–5	4–5	5	5	5	5	5	5	4–5	4	3–4	5	4–5	4	5	4–5	4	3–4	4–5	4–5	5	5	5	4–5	4–5	4–5	4–5	4–5	4–5	D	D	D	D	D	D
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	4–5	4	X	5	4–5	3–4	3–4	4–5	5	5	5	5	4–5	4–5	5	4–5	4–5	4–5	D	D	D	D	D	D
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	4–5	4	1	5	5	4	4	4–5	5	5	5	5	5	5	5	4–5	5	5	4–5	4–5	4–5	D	D	D	D	D	D
	Alkaline	5	5	5	5	5	5	5	5	5	4–5	4	X	5	4	3–4	3	4–5	5	5	5	5	5	5	5	4–5	5	5	4–5	4–5	4–5	B	D	D	D	D	D
Steam Set	Soap	5	5	5	D	D	D	5	5	5	4–5	4–5	4–5	1	3	X	1	1	2	1	2	4	5	5	5	1	1	1	4–5	4–5	4–5	D	D	D	D	D	D
	"Duponol" D Paste																																				
	Neutral	4	4–5	5	D	D	D	5	5	5	3	4	5	1	2	2	1	1	1	1	3	4	5	5	5	1	1	2	4–5	4–5	4–5	D	D	D	D	D	D
	Alkaline	4–5	4–5	4–5	D	D	D	5	5	5	4	5	4–5	1	3	X	1	1	2	1	3–4	4	5	5	5	1	1	2	4–5	4–5	4–5	D	D	D	D	D	D
	"Triton" X-100																																				
	Neutral	4	4–5	4–5	D	D	D	5	5	5	3	4–5	5	1	1	1	1	2	2	1	1	4	5	5	5	2	2	2	4–5	4–5	4–5	D	D	D	D	D	D
	Alkaline	5	4–5	4–5	D	D	D	5	5	5	4–5	4–5	4–5	1	1	X	1	1	2	1	2	4	5	5	5	1	1	1	4–5	4–5	4–5	D	D	D	D	D	D
Can Dried	Soap	5	5	5	5	5	5	5	5	5	5	4–5	4–5	5	4–5	X	5	4	4	4–5	4–5	4–5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	"Duponol" D Paste																																				
	Neutral	4–5	4–5	4–5	5	5	5	5	5	5	5	4–5	4–5	4–5	2	2	5	3	3	4–5	4–5	4–5	5	5	5	5	5	4–5	5	5	5	5	5	5	5	5	5
	Alkaline	4–5	4–5	5	5	5	5	5	5	5	5	4–5	4–5	4–5	2	X	4–5	2	3–4	4–5	4–5	4–5	5	5	5	5	4–5	4–5	5	5	4–5	5	5	5	5	5	5
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	5	5	5	4–5	3	1	4–5	5	4	4–5	4–5	4–5	5	5	5	5	5	4–5	5	5	4–5	5	5	5	5	5	5
	Alkaline	5	4–5	5	5	5	5	5	5	5	5	4–5	4–5	5	3	X	5	3	3–4	4–5	4–5	4–5	5	5	5	5	4–5	4–5	5	5	4–5	5	5	5	5	5	5
Aged	Soap	5	5	5	5	5	5	5	5	5	5	4	4	2	3	X	1	3	3	1	2	4	5	5	5	5	5	5	4–5	4–5	4–5	5	5	5	5	5	5
	"Duponol" D Paste																																				
	Neutral	5	5	5	5	5	5	5	5	5	3–4	4–5	4–5	1	1	2	1	3	3–4	1	2	4	5	5	5	4–5	5	4–5	4–5	4–5	4–5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4	5	5	1	3	X	1	3	3	1	2	4	5	5	5	5	5	4–5	4–5	4–5	4–5	5	5	5	5	5	5
	"Triton" X-100																																				
	Neutral	5	5	5	5	5	5	5	5	5	4	5	5	1	1	1	1	1	4	1	1	4	5	5	5	4–5	5	4–5	4–5	4–5	4–5	5	5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4	4–5	5	1	3	X	1	3	3	1	3	4–5	5	5	5	5	5	4–5	4–5	4–5	4–5	5	5	5	5	5	5

TABLE C—APPENDIX B
REMOVAL OF AMIDO NAPTHOL RED 6B (CI 57) EFFECTED BY VARIOUS SCOURING CONDITIONS

| Processing Treatment | Scour | Residual Tint on Fibers | | |

		Cotton			Acetate			Viscose			Silk			Wool			"Vicara"			Nylon			"Dacron"			"Acrilan"			"Orlon" T-42			"Dynel"			"Saran"		
		Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.		
Processing Treatment	Scour	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205
Control	Soap	5	5	5	5	5	5	5	5	5	4-5	5	5	5	4-5	X	5	4-5	5	4-5	5	4-5	5	5	5	4	4-5	5	5	5	5	5	5	5	5	5
	"Duponol" D Paste																																			
	Neutral	5	5	5	5	5	5	5	5	5	3-4	5	5	3-4	3-4	3	5	4-5	4-5	3-4	3-4	3-4	5	5	5	4-5	4-5	5	5	5	5	4	4	4-5	4-5	4-5	4-5
	Alkaline	5	5	5	5	5	4-5	5	5	5	3-4	4	5	3	3	X	4-5	4	4	4	4-5	4	5	5	5	4	4	5	5	5	5	4-5	4-5	5	4-5	4-5	5
	"Triton" X-100																																			
	Neutral	5	5	5	5	5	5	5	5	5	4-5	5	5	4	4	3	4-5	4-5	4-5	3-4	3-4	3-4	5	5	5	4-5	4-5	4-5	5	5	5	4-5	4-5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4-5	5	5	4	3	X	5	5	4-5	4	5	4-5	5	5	5	4-5	4-5	4-5	5	5	5	4-5	4-5	5	4-5	4-5	5
Heat Set	Soap	5	5	5	5	5	5	5	5	5	5	5	5	4-5	4-5	X	4-5	4-5	5	3	4-5	5	5	5	5	2	2	3	3-4	3-4	4	D	D	D	D	D	D
	"Duponol" D Paste																																			
	Neutral	5	5	5	4-5	4-5	5	5	5	5	3	4	5	3-4	3-4	3	5	5	5	1	2	3-4	5	5	5	2	2	2	3-4	3-4	3-4	D	D	B	D	D	B
	Alkaline	5	5	5	5	5	5	5	5	5	4	5	5	4	3	X	4-5	3	4	2	4	5	5	5	5	2	2	3	3	3	3	D	D	B	D	D	B
	"Triton" X-100																																			
	Neutral	5	5	5	5	5	5	5	5	5	3-4	5	5	4	3	2	4	4	3-4	1	2	3-4	5	5	5	1	2	3	3	3	3	D	D	D	D	D	D
	Alkaline	5	5	5	5	5	5	5	5	5	5	5	5	4	3	X	4-5	4-5	4-5	3	4-5	5	5	5	5	2	2	3	3-4	3-4	4	D	D	D	D	D	D
Steam Set	Soap	5	5	5	D	D	D	5	5	5	3	5	5	1-2	3-4	X	1	1-2	3-4	2	3	3	5	5	5	1-2	1-2	1-2	2	2-3	3	D	D	D	D	D	D
	"Duponol" D Paste																																			
	Neutral	5	5	5	D	D	D	5	5	5	2-3	5	5	1	1	1-2	1	1	1-2	2	3	3-4	5	5	5	2-3	2-3	2-3	2-3	2-3	2-3	D	D	D	D	D	B
	Alkaline	5	5	5	D	D	D	5	5	5	4	5	5	1-2	3	X	1	2	3-4	2	3	4	5	5	5	1	1	1	1	2	2	D	D	D	D	D	B
	"Triton" X-100																																			
	Neutral	5	5	5	D	D	D	5	5	5	2	5	5	1-2	1-2	2	1	1	1-2	1	2	3	5	5	5	1	1	1	2	2	1-2	D	D	D	D	D	D
	Alkaline	5	5	5	D	D	D	5	5	5	3	5	5	1-2	3	X	1	1	3-4	2	2	3-4	5	5	5	1	1	1	2-3	2-3	2-3	D	D	D	D	D	D
Gas Dried	Soap	5	5	5	5	5	5	5	5	5	5	5	5	4-5	4	X	4-5	4-5	5	4-5	5	4-5	5	5	5	4-5	5	5	5	5	5	4-5	4-5	5	4-5	4-5	4-5
	"Duponol" D Paste																																			
	Neutral	5	5	5	5	5	5	5	5	5	4	4-5	5	4	3-4	4-5	5	4-5	5	4	4	4-5	5	5	5	4	4-5	5	5	5	5	4	4-5	4	5	5	5
	Alkaline	5	5	5	5	5	4-5	5	5	4-5	4-5	4-5	4-5	3	3	X	4-5	4	4	4-5	4-5	4-5	5	5	5	4-5	4-5	4-5	5	5	5	4	4	5	5	5	5
	"Triton" X-100																																			
	Neutral	5	5	5	5	5	5	5	5	5	4	4	5	4	3-4	2	4-5	4-5	4-5	3-4	3-4	3-4	5	5	5	4-5	4-5	5	5	5	5	4	4-5	5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4-5	4-5	5	4-5	3	X	4-5	4	5	4-5	5	5	5	5	5	5	5	5	5	5	5	4-5	4-5	5	4-5	4-5	5
Aged	Soap	5	5	5	5	5	5	5	5	5	4-5	5	5	2	4	X	3	3	5	2	3	4	5	5	5	3	4	5	4-5	4-5	5	3	3	4-5	4-5	4-5	5
	"Duponol" D Paste																																			
	Neutral	5	5	5	4-5	5	5	5	5	5	3	5	5	2	2-3	3	1	2-3	3	2	2-3	3-4	5	5	5	2	3-4	5	5	5	5	3	3	3-4	4-5	4-5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4-5	5	5	2-3	3	X	3	4	4	1	2	4-5	5	5	5	3	3-4	4-5	5	5	5	3	3	4-5	5	5	5
	"Triton" X-100																																			
	Neutral	5	5	5	5	5	5	5	5	5	2-3	5	5	1-2	3	2-3	1	2-3	3-4	1	2	3	5	5	5	3	4-5	5	5	5	5	3-4	3-4	4-5	5	5	5
	Alkaline	5	5	5	5	5	5	5	5	5	4-5	5	5	2	3-4	X	2-3	3	4-5	1	2	4-5	5	5	5	3	3-4	5	5	5	5	3-4	3-4	5	5	5	5

TABLE E—APPENDIX B

REMOVAL OF WOOL GREEN S (CI 737) EFFECTED BY VARIOUS SCOURING CONDITIONS

Residual Tint on Fibers

TABLE F—APPENDIX B
REMOVAL OF ALGOL YELLOW GC (Pr 9) EFFECTED BY VARIOUS SCOURING CONDITIONS

Residual Tint on Fibers

Processing Treatment	Scour	Cotton			Acetate			Viscose			Silk			Wool			"Vicara"			Nylon			"Dacron"			"Acrilan"			"Orlon" T-42			"Dynel"			"Zefran"		
		Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.		
		80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205
Control	Soap	2-3	2-3	2	2	2	1	3-4	4	4-5	3	3	3-4	3-4	3	X	3-4	3	4	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	"Duponol" D Paste																																				
	Neutral	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Alkaline	1	1	2	1	1	1	1	1	2	1	1	1	1	1	X	1-2	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	"Triton" K-100																																				
	Neutral	1	1	1	1	1	1	2	2-3	2-3	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Alkaline	2	2	2	1	1	1	3	3	3	2	2	2	1	1	X	2-3	2	4	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Heat Set	Soap	2	2	2	1	1	1	3	3-4	4	2	2	2	3	2-3	X	2	2	3	3	3	2	1	1	1	1	1	1	1	1	1	D	D	D	D	B	D
	"Duponol" D Paste																																				
	Neutral	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	D	D	D	D	D	D
	Alkaline	2	2	2	1	1	1	2	2	2-3	1	1	1	1	1	X	2	2	3	2-3	3	2	1	1	1	1	1	1	1	1	1	D	D	D	D	D	D
	"Triton" K-100																																				
	Neutral	1-2	1-2	1-2	1	1-2	1	3	3-4	3-4	1	1-2	1	1	2	1	2	2-3	3	1	1	1	1	1	1	1	1	1	1	1	1	D	D	D	D	D	D
	Alkaline	1	3	3	1	1	2	2-3	3-4	3-4	2	3	2-3	1	2	X	2	2	3	2	3	2	1	1	1	1	1	1	1	1	1	D	D	D	D	D	D
Steam Set	Soap	1	1-2	2	D	D	D	3-4	4	4	3	3	3	4	3-4	X	2	2	3	3-4	3-4	2-3	2-3	2-3	2-3	1	1	1	1	1	1-2	D	D	D	D	D	D
	"Duponol" D Paste																																				
	Neutral	1	1	1	D	D	D	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	D	D	D	B	D	D
	Alkaline	1	1	2	D	D	D	1-2	2	2-3	2-3	2-3	2-3	1	1	X	2	2	3	2	2	2	1	1	2	1	1	1	1	1	1	D	D	B	D	B	D
	"Triton" K-100																																				
	Neutral	2	2	2	D	D	D	2-3	3	2-3	2	2-3	2-3	1	3-4	2	1	2-3	2	2	3	2	2	2	2	1	1	1	2	2	2	D	D	D	D	B	B
	Alkaline	2	2	2	D	D	D	3	3-4	4	2	2	2	1	1	X	2-3	2	3	2-3	2-3	2-3	2	2	2	1	1	1	2	2	2	D	D	D	D	B	D
Can Dried	Soap	2	2	2	2	2	2	3	3-4	4	3	3	3	1	2	X	3	3	3	2	3	3	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2
	"Duponol" D Paste																																				
	Neutral	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Alkaline	2	2	2	2	1-2	1	3-4	3	2-3	3-4	3-4	3-4	4	2	X	3-4	3	3	3-4	3	2-3	2	2	1	2	2	1	3	2	1	2	1	1	1	1	1
	"Triton" K-100																																				
	Neutral	1	1	1	2	2	2	2-3	3-4	3-4	1	3	3	1	3	3	1	3-4	3-4	1	3	3	1	2	2	1	1	1	1	1-2	1-2	1	1	1	1	1	1
	Alkaline	1	2	2-3	1	2	2	1	3	3	1	3	3	1	1	X	1	3-4	3-4	1	3-4	3	1	2	2	1	2	1	1	2	1	1	1	1	1	1	1
Aged	Soap	2	2	2	2	1	1	2	2	2	2-3	2-3	2-3	3	3	X	1	2	3	2-3	2-3	2-3	2-3	2-3	1	1	1	1	2	1	1	1	1	1	1	1	1
	"Duponol" D Paste																																				
	Neutral	1	1	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1
	Alkaline	2	2-3	3	2	1	1	2	2	2	2	2	2	1	1	X	2	2	3	2	2-3	2-3	2	1	1	1	1	1	2	1	1	1	1	1	1	1	1
	"Triton" K-100																																				
	Neutral	1	1	1	1	1	1	3	3-4	3-4	2	2	2	1	2	2-3	2	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Alkaline	1	2	3	1	1	1	2	3	3	2	2	2	1	1	X	2	2	3	2	2-3	2-3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

TABLE G—APPENDIX B
REMOVAL OF HELINDON PINK R EXTRA (Pr 109) EFFECTED BY VARIOUS SCOURING CONDITIONS

Residual Tint on Fibers

Processing Treatment	Scour	Cotton			Acetate			Viscose			Silk			Wool			"Vicara"			Nylon			"Dacron"			"Acrilan"			"Orlon" T-42			"Dynel"			"Zefran"		
		Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.			Temp., °F.		
		80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205	80	150	205
Control	Soap	3	4	3-4	4	4	3	3-4	4	3-4	3-4	4	3-4	3-4	4	X	4	5	4-5	3-4	3-4	2-3	3	3	2	3-4	3	2-3	3-4	3	3	3	3	2	3-4	3-4	1
	"Duponol" D Paste																																				
	Neutral	2	2	1	3	3	2	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1
	Alkaline	2	3	3	3-4	3-4	3-4	1	1	1	3	3	3	1	1	X	3	4	3-4	2	1	1	1	1	1	2	2	2	3	3	3	1	1	1	1	1	1
	"Triton" K-100																																				
	Neutral	3	3-4	3-4	3-4	4	3-4	3	4	4	3	4	3-4	1	3	3-4	3-4	4-5	4	3	3-4	3	1	3	3	2	3	2	2	3-4	3	3	3-4	3	2	3	1
	Alkaline	3	3-4	3-4	3-4	4	3-4	3	3	3-4	3	4	3-4	1	1	X	3-4	3-4	4	3-4	3-4	3	1	2	3	2	3	2-3	2-3	3-4	3	3	3	3	3	3	1
Heat Set	Soap	2-3	2-3	3-4	2-3	3	3	3	3	4	3-4	3-4	4	3-4	4	X	4	4-5	4-5	1-2	1-2	1-2	1	1	1	1-2	1-2	1-2	2-3	2	2-3	D	D	D	D	D	D
	"Duponol" D Paste																																				
	Neutral	1-2	1-2	1-2	2	2	2	1	1	1-2	2	2	2	1	1	1	1-2	1-2	2	1	1	1	1	1	1	1	1	1	2	2	2	D	D	D	D	D	D
	Alkaline	2	2-3	2-3	2-3	2-3	2-3	1	1	1	2-3	3	2-3	1	1	X	2	3-4	3	1	1	1	1	1	1	1-2	1-2	1-2	2-3	2-3	2-3	D	D	D	D	B	D
	"Triton" K-100																																				
	Neutral	2	2-3	2-3	2-3	3-4	3	2-3	3	3-4	2-3	4	3-4	1	3	4	3	4-5	5	1	1-2	1-2	1	1	1	1-2	1-2	1-2	2-3	2-3	2-3	D	D	D	D	D	D
	Alkaline	2	2-3	3	2-3	2-3	3	2-3	2-3	3	3	3	3-4	1	1	X	3-4	3-4	4	1-2	1-2	1-2	1	1	1	1-2	1-2	1-2	2-3	2-3	2-3	D	D	D	D	D	D

| | | |

1954 Annual Convention——

FAST-COLOR PRINTING*

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New York

The author discusses broadly the present status of fast-color printing in five sections, one for each of the five types of colors used for such work: vat dyes, leuco esters of vat dyes, insoluble azo dyes, bonded pigments, and special types. For each kind of colorant he considers its advantages and disadvantages, the formulation of print pastes, factors influencing results, methods of application, after-treatment for development or fixation of the color, and the effect of some finishing operations on the final fastness properties of the particular color.

INTRODUCTION

ALTHOUGH plant experience has brought me into contact with both dyeing and printing, I must admit that, to me, printing is the more fascinating subject. I greatly admire and respect the many developments of the textile printing industry.

A number of years ago when I was in a plant, a customer came to see me and inquired as to the finishing price for dyeing a certain fabric in a number of shades. When I quoted the price, he ran true to the form of many customers who seemed to have a very limited vocabulary in discussing finishing prices, which consisted of, "How much" and "Too much." I then explained to him how the price was justified by all the labor, material and equipment necessary to produce the desired results. He could not refute these facts, and then he had a bright idea. He said, "Why not just dye the goods on one side and then it will cost only half as much?" Such a suggestion might stump a dyer, but not a printer, for here is a sample of U S Army 5-oz twill used for tents, which is an OG shade on one side and white on the other. This was done by a printer, so I think you will understand my respect for the printers. However, I assure you that doing it this way did not cut the cost in half. As a matter of fact, they can do better than that, for here is a sample which is one color on one side and another color on the other side.

On the other hand, in considering textile printing, I often wonder whether, in any other industry, such contradictory opinions and practices exist. Many of the statements I am about to make are highly debatable. They are based upon actual operations encountered, and yet you may take an exactly opposite stand. Oddly enough, in many instances I would have to agree with you, for, although I can take you to some plants to verify my statements, I could also take you to other plants to substantiate your contradictory opinion. I have been in a plant in the morning and been told that a certain formula or process definitely would not work, and that afternoon have gone into another plant and learned that they are doing it that way every day. Therefore, at the outset, I want to admit your right to question many comments made hereafter.

There is an ever widening demand for increased fastness in all textiles, whether dyed or printed, and there are various types of coloring materials available, each one of which has its own individual characteristics. The materials used for fast color printing can be divided into five groups as follows:

I Vat dyes
II Azoic dyes
III Leuco esters of vat dyes
IV Bonded pigments
V Special types

The variations in characteristics of each of the above group include formulation for application, processing in connection with fixation or development, advantages and disadvantages, and effect of various finishing treatments. These factors will be discussed under each group.

I VAT DYES

Vat Dyes are known for their outstanding fastness properties and are available in such a wide range of shades that practically any color combination can be produced. They are used extensively in fast-color printing.

The dye manufacturers have made tremendous strides in the preparation of vat pastes for printing. Through control of particle size, use of dispersers, accelerators, catalysts, and humectants, the working properties have been greatly improved, and the color yield materially increased over that of the old pastes having the same content of dyestuff.

In the formulation of pastes for printing, wide diversity of opinions and practices still exist. In spite of all that has been said and written about the preparation of print pastes and the effect of various factors, wide discrepancies still exist as regards color costs, color yields and working properties, and, in many instances, there is material room for improvement. Several points have been established which should always be considered in connection with vat-color printing by the conventional method. Some of these are:

a) Many thickeners have affinity for the reduced dye, so that the larger amount of the thickener present the greater will be the amount of dye taken up by the thickener rather than by the cloth. Dye so taken up is washed out in soaping.

b) Various materials can cause agglomeration of pigment particles, which in some cases may not be of such an extent as to produce visible color specks but can cause a drop in color yield.

c) The choice of alkali is generally a matter of individual preference, but this should not prevent final decision being based upon actual cost.

d) The fact that certain materials added as "humectants" have more solvent action than hygroscopic properties has been demonstrated. However, much remains to be known on this subject. For example, in some tests which were made, a paste was prepared which contained all the ingredients except the "humectant." This was divided into three parts. To one part 7% of glycerine was added, to the second part 7% of urea was added, and 3½% of glycerine and 3½% of urea were added to the third part. These pastes were then used in printing a number of vat printing colors. One portion of each print was aged in a laboratory ager at 212°F. Another portion was aged in a plant ager where the temperature was 230°F. In a number of instances the paste containing 3½% Glycerine and 3½% urea gave the best color yield under both aging conditions. This is hard to

* Presented before the Symposium on Printing in the Pompeian Room of the Atlanta Biltmore Hotel in Atlanta, Georgia, on Friday morning, Sept 17, 1954, with Raphael Rupp presiding.

understand and warrants further study. With the ever-increasing number of humectants and solvents available, the entire subject could be investigated to advantage. A few trials with organic bases that act as reductants and solvents showed interesting possibilities.

The conventional method of printing vat dyes, which has been followed for years, has been to prepare a print paste that contains vat dye, thickener, alkali, reducing agent, and "humectant" or solvent. The cloth is dried immediately upon leaving the print machine. The printed goods are then passed through a steam chamber, which must be free of air. During this process, which is called "aging", the vat dye is reduced to its soluble leuco form and is absorbed by the fiber. This method presents many problems, and there are many factors which can materially affect the finished results. In drying the printed cloth as it comes off the machine, care must be taken not to overdry it, since, if this is done, an appreciable amount of the reducing agent will be destroyed. Under this condition there will not be sufficient reducing agent present to reduce the vat dye in the ager and considerable color value will be lost. After leaving the print machine dryer, the cloth should not lie around too long before aging. If too long a period elapses before aging, two detrimental things may occur:

1) The printed cloth will tend to heat up on lying, causing decomposition of some of the reducing agent with an attendant loss in color value.

2) The edges of the pile of cloth will tend to cool off while the center will not cool off or may even increase in temperature. This will result in an uneven moisture content across the goods or a variation in amount of reducing agent across the width, either of which may cause shading from side to center.

In aging, several difficulties present themselves. With a forced draft to remove the steam emerging from an ager or with a change of direction of the wind with a natural draft, air may get into the ager, and the presence of a very small amount of air will greatly reduce color yield.

A variation in steam pressure or flow of steam can result in shaded goods.

When cloth enters an ager, it immediately picks up moisture from the steam. When this occurs, the latent heat of the steam absorbed as moisture is liberated. This results in a rapid and large increase in temperature. As the temperature of the steam in the ager increases, the relative humidity of the steam decreases. For example, at 230°F the relative humidity of steam at atmospheric pressure is 70%. At 70% relative humidity cloth will pick up about 50% as much moisture as it will at 95% relative humidity. The moisture must be present to allow the leuco compound to pass into solution and to be absorbed by the cloth. Any vat dye not reduced and absorbed by the cloth will be washed off in subsequent washing and will cause a drop in color yield.

Many of the difficulties in the conventional printing method are overcome by the process to be described at this Symposium in a paper entitled "New Development in Vat-Dye Printing" to be presented by A K Saville.

II LEUCO ESTERS OF VAT DYES

With the leuco esters of vat dyes, the final results obtained on the fabric are the same as when the corresponding vat dye is applied, and their unique properties permit them to be used under conditions where the vat dyes could not normally be used.

The leuco esters of vat dyes are water-soluble, are applied in this form, and are developed by oxidizing agents in the presence of acid. This property makes them particularly suitable for use in conjunction with the stabilized azoics, which are developed by acid aging. These two classes of dyes supplement each other, so that a full range of shades is possible.

The printing paste used with the leuco esters is usually much less expensive than that used with vat dyes because of the presence of a considerable amount of chemicals in the latter. On the other hand, the leuco esters are more expensive than the corresponding vat dyes. As a result of this set of conditions, it is more economical to use leuco esters for light shades, but the vat dyes are more economical in heavy shades. The limit of solubility of some of the leuco esters is also a controlling factor in their use.

During the war, when there was a scarcity of leuco esters, they were largely replaced by resin-bonded pigments. Now that both types are readily available, they are used interchangeably, selection being based upon the depth of shade, fastness requirements, and/or whether the printed goods are to receive a resin finish or other special finish.

The thickeners usually employed with leuco esters are starch, modified starch with no reducing properties, gum tragacanth, alginates, or cellulose ethers. It is customary to use urea to aid in the solution of the leuco esters, generally twice as much urea as dye.

Neutral chromate is added to the print paste, and certain colors require the addition of acid-splitting salts, such as ammonium sulfocyanide or ammonium chloride. With some leuco-ester dyes that tend to oxidize upon standing, it is advisable to add a small amount of thiourea to the print paste.

Several methods are in use to develop the leuco esters after printing and drying:

1) Neutral steaming, in which case the print paste contains sodium chlorate, ammonium sulfocyanide and a small amount of ammonium vanadate as a catalyst.

2) Acid aging.

3) Acid aging, followed by a run through a solution containing one-half percent sodium bichromate and one to two percent of sulfuric acid at 170°F. Another method of printing and developing leuco esters consists of preparing a print paste which contains the solution of the dye, thickener and sodium nitrite. As such print pastes are not too stable, the sodium nitrite should not be added until just before printing. The dried prints are then run through a sulfuric acid bath, to which urea has been added to reduce the fumes.

As the solutions of the leuco esters are almost colorless, it is very difficult to see them while printing. By adding fluorescent materials to the print pastes and installing an ultraviolet light in front of the print machines, defects in printing can be seen as they occur.

Among the advantages of the leuco esters are the following:

1) They tend to give smooth prints on some of the more difficult fabrics.

2) They can be used to shade stabilized mixtures of diazo compounds and naphthols, whereas, with combinaitons of the latter, there is a possibility of cross coupling, so that the resultant shade would be far different from what was expected.

3) They can be used for resist prints under aniline black, vat-pad dyeings, and naphthols.

4) They are not so sensitive to variations in aging or developing conditions as vat colors.

5) Some of them can be developed by light and so have been used for photo printing.

6) Dyeings with leuco esters can be resisted with printed patterns containing alkalis or reducing agents.

III INSOLUBLE AZOICS

The insoluble azo dyes are very important in fast-color printing both for ground shades in discharge or resist printing and in application printing. The numerous ways in which they can be applied permit their use alongside vat dyes, leuco esters, or resin-bonded pigments. They are "ingrain" types, as the insoluble azo compound is formed in the fabric. The insoluble azo compound is produced by coupling fast-color salts with naphthols.

As ground shades, they can be dyed

in the conventional manners and then discharge-printed with vat dyes. In resist printing, the naphthol can be applied either before or after printing. The fast-color salts are then applied, whereby the ground shade is produced where no resist is present.

In application printing, various methods are used as follows:

1) TWO-STEP PROCESS——The cloth to be printed is padded through a naphthol solution and dried. Nonsubstantive naphthols are used so that they will wash out later from the unprinted areas. Solutions of fast-color salts are then printed, whereupon coupling takes place almost immediately. It is customary to add a little acetic acid to the paste of fast-color salts to retard coupling. If this is not done, the print paste does not have time to flow together, and the lines in the ground of the engraving are liable to show. The rates of coupling of the different fast-color salts vary considerably. Therefore, in printing mixtures, if there is a material difference in the rate of coupling, much of a faster-coupling one will react before it penetrates the fabric. A slower one will penetrate before much coupling takes place, and the resultant effect is an appreciable difference in shade between the face and the back of the fabric.

Vats, leuco esters, and pigments can be printed in the same pattern with fast-color salts, and then the printed cloth receives the customary treatment for the particular type. When vat dyes are printed in conjunction with fast-color salts, a mild oxidant, such as sodium metanitrobenzenesulfonate, should be added to the salts print paste to prevent the fast-color salts from being affected by the sulfoxylate-formaldehyde used in the vat-dye print paste.

In the two-step process the entire cloth to be printed is impregnated with naphthol solution regardless of the area to be printed. This is an appreciable item of cost. This cost is not present when stabilized mixtures of naphthols and diazo compounds are used. Therefore, there is a point in the area to be printed below which it is more economical to use one method and above which it is more economical to use the other. Formerly, we considered that it was not economical to use the two-step process unless the area to be printed was at least 35% of the entire cloth area. Recently, there has been a drastic reduction of the prices of the stabilized mixtures of diazo compounds and naphthols. At present prices it is thought that, unless the coverage of the pattern to be printed is 50% to 60%, it is not economical to use the two-step process.

2) STABILIZED MIXTURES OF NAPHTHOLS AND DIAZO COMPOUNDS——This group of dyes has several advantages and is therefore widely used. Their application and development is very simple. As they consist of mixtures of naphthols and diazo compounds with a stabilizing agent, coupling does not take place until an aftertreatment is given. A range of naphthols can be used with the various diazo compounds, whereas in the two-step process, only one naphthol can be used with all the fast-color salts. In the preparation of these dyes a variety of shades can be produced by mixing different naphthols with one diazo compound.

After printing, a short acid aging enables coupling to take place and the final shade develops.

As a variety of naphthols and diazo compounds are used, if mixtures are made, cross coupling may take place whereupon the resultant shade may be far different from what was expected. This difficulty can be overcome by shading with leuco esters and both types will develop in acid aging.

For thickening the print paste, starch is commonly used, also gum tragacanth or mixtures of starch and trag. However, as these do not wash out too readily, they present difficulties when a soft finish is desired, or if the cloth is to receive a resin finish. In these instances, cellulose ethers or alginates are used. To prevent jelling of the alginates, triethanolamine or ammonium gluconate is added to the print paste.

These stabilized mixtures can be used alongside vat dyes by the addition of neutral developers to the print pastes containing the stabilized mixtures. Development then takes place during the neutral aging process for the vat dyes. This process is quite expensive as from six to twelve ounces of developer is used to a gallon of print paste, depending upon the color, and the color yield is generally not so good as in acid aging. A new type of stabilized mixtures is now being developed whereby coupling takes place under the influence of heat.

As most of the solutions of this type of dye are pale straw color, it is very difficult to see them while printing. Therefore, it is customary to add sighteners to the print pastes. Even with the addition of sighteners, they are not so visible during printing as are the vat dyes, coupled azoics and resin-bonded pigments. Here, as with the leuco esters, the difficulties arising from the lack of visibility can be minimized by adding fluorescent materials to the print paste and installing an ultra violet light in front of the print machine.

Since the print pastes of the stabilized mixtures of diazo compounds and naphthols are alkaline, they present difficulties when they are used alongside or falling on aniline black.

3) COUPLED AND SOLUBILIZED COMBINATIONS OF SALTS AND NAPHTHOLS——Another type of insoluble azo dye is in the process of development which has several advantages. These are mixtures of fast-color salts and naphthols that have been coupled and then solubilized. After printing, the insoluble azoic product is developed by a treatment with alkali. The valuable features of this type are as follows:

A) They are fixed with neutral aging and so can be printed alongside vat dyes.

B) Being coupled, they are approximately the final shade and hence are readily visible in printing.

C) Being completely coupled, there is no possibility of cross-coupling and can therefore be shaded with each other the same as vat dyes.

D) They have the brightness of the azoic dyes, and, by supplementing them with vat dyes, prints of maximum fastness can be produced in practically any range of shades.

E) They can be printed either in contact with or falling on aniline black. This permits the economy which aniline black affords.

Any of the ordinary thickeners used with insoluble-azo-type dyes are satisfactory for this class. Among them are starch, starch-trag mixtures, alginates, cellulose ethers, and other prepared pastes. The extent to which the thickener must be washed out in subsequent soaping would be the principle factor in determining the type of thickener used.

IV RESIN-BONDED PIGMENTS

The developments in the application of resin-bonded pigments to textile fabrics have come along at a very rapid rate. They are either organic or inorganic pigments with no affinity for fibers but are fixed with bonding agents. Some of these pigments have extreme light fastness, but, when applied to fabrics by this method, their fastness to washing, crocking, and wet abrasion depends upon the binding medium and method of curing, or fixing, same. The pigments themselves are practically unaffected by any of the processes used in the development or fixation of other types of print colors. The only point to consider, therefore, is what effect any aftertreatment has upon the binding properties of the fixing media.

The fact that resin-bonded pigments do not depend upon the affinity of the coloring material for the fiber makes them particularly advantageous in printing synthetic fibers, which present dyeing

problems. Inasmuch as the pigments are held mechanically to the fabric, their usage is independent of the nature of the fibers composing the cloth.

The printing pastes for pigment printing are of three types: water-in-oil emulsion, oil-in-water emulsion, and all-aqueous-phase medium. Each type has its individual characteristics, which the printer can use to advantage. For example, the water-in-oil emulsion is not readily miscible with the oil-in-water or all-aqueous phase. Therefore, by alternating these types in the rollers of a multicolor pattern, the necessity for reversing rollers can frequently be eliminated. For example, if a yellow and a blue are to be printed together and the print vehicle for both colors is of the same type, it is impossible to prevent the first color from affecting the succeeding color during printing. However, if one color is of the water-in-oil type and the other color is of the oil-in-water or all-aqueous-phase type, contamination is avoided.

In a water-in-oil emulsion the water acts as the thickener and is thus a very inexpensive print vehicle.

After printing, a heat treatment cures, or polymerizes, the binding material, so that the pigments are firmly adfixed to the cloth. Many pigment colors are printed in conjunction with azoic dyes that are acid-aged. The acid aging accelerates the polymerization of the binding material for the pigments and materially improves their fastness. In fact, in many instances this improvement in fastness is so marked, some plants make a practice of acid-aging all pigment prints even though no azoic dye is present in the pattern.

As the pigments are bonded mechanically to the fabric, their fastness depends upon the durability of the binding medium. In the early stages of this development, difficulties were encountered from the pigments' rubbing off, or crocking. The producers of this type of coloring materials have made tremendous strides in overcoming this defect, and today low-crock colors are available, which are very superior to previous types in fastness to crocking.

As previously stated, the three types of print vehicles have individual advantages and, in some instances, disadvantages. With the water-in-oil emulsion, it is more difficult to wash print rollers, color boxes, furnishers, back-greys and blankets, and there has been a tendency for the solvent to affect some types of rubber blankets. However, skill in practice permits this type to be used on a large scale without undue complications. There has been a tendency for pigments to mark off in calendering resin-finish goods. Some producers of this type of work feel that the water phase is better in this respect than the water-in-oil emulsion.

As printing with resin-bonded pigments presents several advantages over the other types of fast-color printing, the entire subject has received intensive study. This applies to the producers of coloring materials in Europe as well as in this country. These studies have resulted in a continual offering of new formulations which produce progressively better prints. Types are now being received from Europe which produce prints having excellent fastness to crocking even with a black. These are oil-in-water emulsions, which, as stated previously, have certain advantages.

The question of wet abrasion is coming to the fore, particularly with the tendency of some housewives to overload their washing machines. When this occurs, the cloth is not free to move during the washing so that some folds tend to remain in the same position and, hence, receive an undue amount of abrasion. When the cloth is subsequently smoothed out, the creases which have received an undue amount of abrasion appear as light streaks or "crow's feet". This problem, like all of those previously encountered, is receiving serious attention and, undoubtedly, new developments to improve this condition will occur.

V SPECIAL TYPES

In addition to the preceding general types of dyes used in fast-color printing, there are some special dyes that have particular interest. An important one of these is the phthalocyanine group, the dyes of which are ingrain in that the insoluble pigment is formed in the fabric. There are a number of variations of this type appearing on the market under various trade names, and their application differs somewhat. The general principle is to apply them in solution form, and the insoluble pigment is formed by heat, neutral aging, or acid aging. Some types can be shaded with leuco esters or stabilized azoics.

A number of thickeners are used, among which are gum tragacanth, starch, modified starch with no reducing properties, mixtures of starch and trag, and locust-bean gum. Other thickeners, such as alginates and cellulose ether carboxylic acids, are used where the copper or nickel salts do not cause precipitation.

This type of dye produces pure bright shades. When finally fixed on the fabric, they are insoluble pigments and are therefore unaffected by special finishing processes, such as anticrease. After development, the printed cloth should receive a good soaping to remove any loose pigment.

Recently, a special type of sulfur black for printing has come into extensive use. Previously, difficulties were encountered when efforts were made to print sulfur dyes, but this new product works very satisfactorily. It is applied in conjunction with glucose and potash, then fixed with neutral aging. The shade produced is a full jet black, fast to soaping and crocking. Among the advantages of this dye are the following:

1) As it is not affected by hydro, it can be printed in contact with or falling on vat dyes.

2) The cost is less than that of a vat black.

3) Although more expensive than aniline black, it is completely visible in printing, and this enables the amount of seconds to be at a minimum.

4) When printed on dyed grounds, no halo is produced, as is liable with vat blacks.

Most of the ordinary thickeners can be used with this dye. After neutral aging, the cloth receives a good soaping. The final shade is unaffected by resin or other special finishes.

VI SPECIAL FINISHES

In the last few years, there have been tremendous strides in the development of special finishes. As a result, we have today fabrics made from the old natural fibers which possess properties undreamed of previously. One requisite of these finishes has been that they shall be durable, which was necessary in order to obtain public confidence. This durability has been emphasized and advertised, and not only must the finishes have good fastness, but the coloring materials as well, and this has resulted in an increased demand for fast-color printing.

In an effort to obtain special finishes, a wide variety of products have been used. Among them were various synthetic resins, plasticizers, softeners and other types of compounds. While in some instances unusual effects were obtained, there were occasional instances where these materials had quite a surprising influence on the fastness properties of the coloring material. For example, a fabric containing vat colors with extremely good fastness to light was given a special finish. The finished fabric was so phototropic that, after only five minutes' exposure in the Fade-Ometer, there was an extreme change in shade. The original shade returned comparatively quickly when light was excluded. It is admitted that this was an unusual incident, but it does indicate the necessity of fully investigating the effect a new finish may have upon the light fastness of various dyes.

In considering fast-color printing, the foregoing has referred largely to the printing of cotton and viscose fabrics as

these two lines constitute the major portion of printed fabrics. The dyes discussed heretofore are used extensively on these items and are also used on other fibers.

For acetate, the disperse, or acetate, dyes are used quite extensively. However, for maximum fastness, vat dyes are frequently used. They are applied in the conventional manner. The alkali present in the vat printing paste causes partial saponification of the acetate fiber, so the reduced vat dye is absorbed.

With nylon, prints of good light and wash fastness are produced with a selected group of acid and premetalized acid dyes. As the results obtained on nylon vary with each individual dye, it is necessary to select those dyes that are most satisfactory.

The newer synthetic fibers, such as the acrylic and polyester types, present problems in printing, although, to date, the amount of such goods which have been printed is extremely small. In some instances the same dyes used in dyeing these fibers have been used in printing. However, as previously stated, resin-bonded pigments, which are not dependent upon the affinity of the dye for the fiber, are very satisfactory.

This has been a general survey of the principle items used in fast-color printing. To attempt to go into more technical detail would expand this paper into a large-sized volume. It is hoped that this discussion will show you the wide variety of coloring materials available to the printer, and also that you will respect his skill, ingenuity and ability and be confident that he can and will supply you with printed goods which will meet your requirements.

193rd Council Meeting—

(Concluded from page P33)

SECRETARY'S FINANCIAL REPORT—OCTOBER 28, 1954

	Applications	Dues, Regular & Reinstate	Dues, Corporate & Sustaining	Miscellaneous*	Totals
Received & transmitted to Treasurer, August 1 to October 28, 1954	1549.00	23118.50	980.00	7656.61	33304.11
Leaving deposited by Treasurer with Secretary					2559.47

* Miscellaneous items:

American Dyestuff Reporter Award funds	1001.10
Reimbursement for convention mailing & travel	965.72
Reporters & reprints	29.55
Year Books	416.32
Crockmeters	906.77
Crock cloth	174.00
Multifiber cloth	405.74
Moth cloth	102.50
Water test apparatus	63.85
Dyed standards	57.00
Knitted tubing	4.00
Gas fading units	96.00
Buttons	4.75
Color Transfer Charts	499.00
Colour Index	279.00
Analytical Methods	220.61
Application of Vat Dyes	432.28
Standard grease wool	55.00
Grey scales	37.50
Accelerotor liners	5.00
Symposium receipts	1852.57
Cotton skeins, commissions	48.82
	7656.61

H C CHAPIN, *secretary*

SENIOR

D H Aldi
F C Ames
J R Anderson
R S Aries
E F Armatys
W W Arnold
B M Barbosa
W Beck
H A Birdsall
T J Bivens
R H Boggs
A A Bouchard
C H Briner
N M Canaris
J J Cannon
D W Chaney
V P Clarke
J L Collier
R S Cooke
E Coss
R A Dardennes
M C Davenport, Jr
R B Diaz
A V DiPetrillo
O P Durheimer
B J Falanga
H E Fortner
F H Forsiati
R M Gaffney
A Garcia
A W Gaucher
J V Geary
G R Genta
S Goldman
G J Gradel
P E Grant
J R Hendricks
J A Howse
B Isenogle
H R Ketchie
F H Kranz
H Kroll
G V Kubu
F J Ladr
M Legasse
W C Lonon
J A McSheehy
W W Metcalfe
R O Meyer
J J Monastero
R E Morschner
J B Mumma
J W Munsell
J C Murphy
W W Murphy
C E Neale
B Nilssen
P H Orser
B M Phelan
W Potempski
M J Reichman
C C Rendino
H Repokis
J J Romano
M H Rowe
S J Schaeffer
W L Schulz
V Shutz
J M Schwartz
P R Seargeant
S Seass
M J Spencer
J L Taylor
L H Twombly
A E Verbyla
E C Wagoner
W B Welch
J O Whitaker
W G Wolfgang
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E Victor

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C A Dziadzio
S Eisner
J Emlen
R A Ford
R G Funk
H Gadberry
A Garel
W C Hoffman
E Itoh
R J Kissiah
W A Lowell
J H Martin
A J Raynor, Jr
W A Reid
B L Scallet
P T Sessions, Jr
F I Sheps
J E Thornton
R B Waldeisen
N Weinberg
J Westerman
H G Withers, Jr
R C Wolfe

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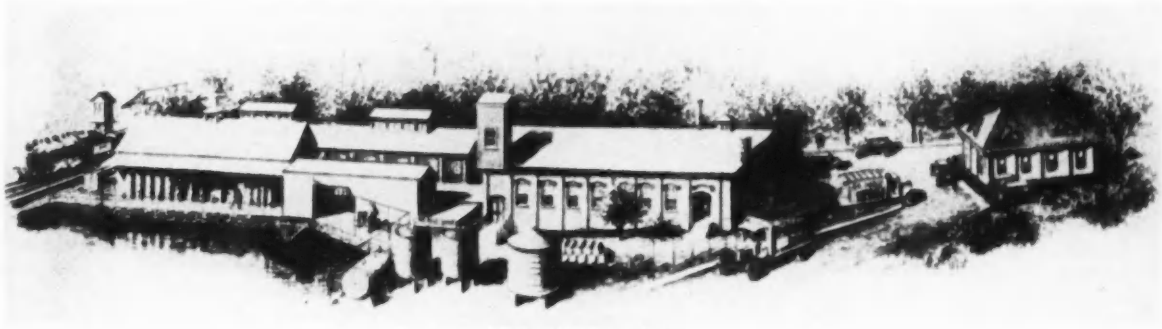
J B Baughn, Jr
E I Broadhead, Jr
A Brodman
J A Cardonna
S Cear
A H Cole
H Feitlowitz
J Fernandes, Jr
H E Gochman
M G Gropper
R S Hager
D M Hankins
A M Hoffman
E J Hogan
G H Howard
J M Joseph
F J Kiluk
R W Kingirski
M I Khan
M Kostko
K A Kovaly
C B Littlefield
O A Martinez
R C Miller
M C Novak
L D Palewsky
G E Saigh
Z L Salewycz
D A Singer
R W Tabloski
S C Tumminello
R S Turry
H Turchin
J A Varner
F Velantzas

Transferred from other classifications to Senior

R H Austin, Jr
J A Baird
J J Barnhardt, Jr
H W Barrow
R L Burgess
L C Cloninger
R M Creegan
L C Gardner
A F Garrison, Jr
G Garvey
H M Gorton, Jr
L C Harmon, Jr
K W Hays
L C Kolodny
D E Lacovara
J Malenkos
D J McCartney
L V Mackin, Jr
E J Mendell
R R Mercer, Jr
M G Michael
J B Monego
R C Morin
M A Morris
R E Morrison
B B Moss
D J Noonan
A L Perrin
H Pike
G M Randolph
H R Ronson
J M Ross, Jr
F A Sheldon
R R Stewart, Jr
H A Strauch
R W Sumers
J G Templeton
W N Thibodeau
G T Womack
N D Wonch
O Yeaton
J M Zambo

Respectfully submitted,
H C CHAPIN
Secretary

• NEWS OF THE TRADE •



Original Royce plant

• Royce Chemical Marks 25th Year

The Royce Chemical Company of Carlton Hill, N J, is celebrating the completion of 25 years of operation.

Sharing the anniversary are five employees who have been with the company since its founding in 1929. Robert S Griffith, Nicholas Sisco, Stanley Dobol, Gerard Geene and Martin De Jong received suitably inscribed gold watches in recognition of their pioneer service with the company.

Albert J Royce, president and founder of the quarter-century-old textile chemical house, made the presentations during a brief ceremony held at the Company's Carlton Hill plant and office. He said that over half of all Royce employees have been with the company five years or more, and one-quarter have been with the company ten years or longer.

Royce plant as it is today

• Stein, Hall and American Maize Celebrate 25 Years of Service

The 25th Anniversary of their unique industrial agreement, which has enabled both companies to operate as one, will be celebrated by Stein, Hall & Co, Inc and American Maize-Products Co. Robert Strasser, executive vice president of Stein Hall, and James B Melick, vice president of American Maize, have announced that the anniversary plans include a specialized advertising program to emphasize the benefits that this industrial relationship has brought to corn starch and dextrine users.

This unusual partnership provides highly specialized corn starch and dextrine service in the form of research, manufacturing facility, technical service and technical sales.

Stein Hall and American Maize will endeavor to tell their story to as many people as possible and are using as their slogan—"When you buy from Stein Hall, you buy American Maize."

• U S Supply Co to Represent Gabb Special Products

The United States Supply Co, East Providence, R I, has been named manufacturers' representative for the Shear-Flow, a portable-type mixer manufactured by the Industrial Mixer Division of Gabb Special Products, a Division of The E Horton & Son Co, Windsor Locks, Conn.

The Shear-Flow, designed to mix liquids and pastes, was originally developed for mixing the more viscous types of textile printing inks, but it has been finding additional applications in the chemical industry.

Metro-Atlantic, Inc, Centredale, R I, has announced the introduction of a new series of durable water repellents for all types of fabrics. The series, to be marketed under the name Ranedare, is comprised of Ranedare R for synthetics, Ranedare C for cotton, and Ranedare S, a silicone for synthetics.

It is understood that patents are being applied for on these products.

More specific details of these products will be covered in the January 31st issue under "New Products and Developments".

• Westvaco Completes New Plant for Sodium Hexametaphosphate Production

Westvaco Mineral Products Division, Food Machinery and Chemical Corporation, New York, has completed the first plant for the production of sodium hexametaphosphate on the West Coast at Newark, Calif. The new facility has a reported capacity in excess of 12 million pounds per year in various forms, including powdered, granular, flake and "plates". Westvaco Mineral Products Division also operates a hexametaphosphate plant at Carteret, N J. Sodium hexametaphosphate made at both plants is marketed under Westvaco's brand names Hexaphos and Fosfodril.

• GRC Incorporated in Rhode Island

The firm Gagliardi Research Corporation, 157 Main St, E Greenwich, R I, was officially incorporated under the laws of Rhode Island on January 4th. D D Gagliardi heads the firm, which performs research and development work for "outside" clients and textile consulting services.

• Mobay Building Plant for Manufacture of Isocyanates

A full-scale production plant for the manufacture of isocyanate chemicals is being built near New Martinsville, W Va, by Mobay Chemical Company of St Louis, Mo.

The recently-formed Mobay company is jointly owned by Monsanto Chemical Company of St Louis and Farbenfabriken Bayer AG of West Germany. Monsanto has been producing the new isocyanates in a small-scale interim plant at Anniston, Ala. The Bayer company has been in commercial production of the chemicals in Germany for more than two years.

The new plant will be capable of producing several hundred tons of isocyanate chemicals a month and equivalent amounts of polyester resins, according to David L Eynon, Mobay president. Until the new plant is in operation, Mobay will supply the chemicals from the interim plant at Anniston and from imports of the chemicals from Bayer.

Complete production facilities for Mobay's resins are being constructed on a 200-acre site which Mobay has acquired, seven miles north of New Martinsville, on the Ohio river. The new plant will be adjacent to Columbia-Southern Corporation's chemical plant which will supply some of Mobay's raw materials by pipeline. The plant will be in operation in 9 to 12 months. Twelve structures will be built, including production facilities, and office and service buildings. Mobay's general headquarters, including its sales staff and development department, will remain in St Louis.

• IPR Symposium to Highlight "Blend Engineering"

The fourth conference of a symposium on "Fundamental Fiber-Fabric Relationships", conducted by the Institute of Polymer Research at The Polytechnic Institute of Brooklyn, Brooklyn, N Y, will be held Saturday, Feb 4 with Carl A Setterstrom, Carbide and Carbon Chemicals Co, presiding. The conference topic will be "Blend Engineering".

The symposium will continue with a conference on "Fiber-Yarn-Fabric Relationships" on March 5th with Milton Harris, Harris Research Laboratories, presiding, and will be concluded on April 2 with a parley on "A Challenge to Industry", J B Goldberg, consultant, presiding.

The conferences are being offered during Polytechnic's centennial year, which is being celebrated under the theme "Science, Engineering, Research for Human Well-Being". Earlier conferences have covered "Intrinsic Fiber Properties", Fiber Form Factors", and "Fiber Interactions". Jack J Press, U S Navy Clothing Supply Office and The Institute of Polymer Research, is serving as general chairman of the symposium.

Schlier

Shulman

• Schlier, Shulman Purchase Control of Washine National Sands, Inc

The purchase of complete control of Washine National Sands, Inc, with offices in Long Island City, N Y, and a plant in Lodi, N J, has been announced by Morris M Schlier and Herman M Shulman, the new owners and officers of the company.

Manufacturers of sodium hypochlorite and distributors of industrial and laundry chemicals, Washine National Sands, Inc has been in business for over 35 years.

Having recently completed an ammonia converting plant, Washine reputedly is the first company in its area to deliver perchlorethylene in tank wagons and the first distributor to make its own aqua ammonia from ammonia gas.

Mr Schlier, the new president of the company, has been associated with Washine as technical director since 1939.

The new executive vice president and treasurer, Mr Shulman, was associated with the St Regis Paper Co, R H Macy & Co and Philipp Bros, Inc as a chemist prior to joining Washine, and has been manager of chemical sales there since 1943.

• New Du Pont Lab for Pigment Colors

A new laboratory for research on pigment colors has been completed by the Du Pont Company at its Newark, N J, pigments plant. Research formerly conducted at several locations on the plant will be consolidated in the new building.

The laboratory was opened officially on December 10 with an inspection tour by about 700 research and production employees and members of their families.

One of the tour's principals was a former Newark plant foreman, Frederick H Weismuller, now general manager of the Du Pont Pigments Department. He made a brief talk and officially presented laboratory keys to J Nelson Tully, laboratory director. Garrett R Cantwell, plant manager, presided.

The character of work to be performed in the laboratory and the function of various pieces of equipment were shown during the tour by exhibits, which featured some of the uses of pigment colors.

• Richardson to Address CATCC Section

Francis S Richardson, Waldrich Co, will discuss "High-Temperature Dyeing Procedures" at the next regularly scheduled meeting of the Quebec Section, Canadian Association of Textile Colourists and Chemists on February 19th at McGill University, Montreal, Canada.

Earlier meetings of Section during the 1954-55 Session have featured the following: *Oct 16, 1954*—"The Performance of Dyestuffs at High Temperatures", Maurice R Fox, Arnold, Hoffman & Co, Inc; *Nov 20, 1954*—"Modern Finishing of Cotton Fabrics", George M Gantz, Antara Chemicals; *Dec 11, 1954*—"Microscopical Dyeing Phenomena", Henry Millson, American Cyanamid Co; *Jan 15, 1955*—Panel discussion on "Dyeing and Finishing."

* * *

On January 14th Walter J Hamburger, director, Fabric Research Laboratories, delivered an address on "Tensile Properties of Fibers" to inaugurate a new series of four symposia on textile technology sponsored by the Quebec Section, CATCC. The '55 series is entitled "Mechanical Properties of Textile Fibers and Yarns".

The next speaker in the series will be J W Balou, Pioneering Research Laboratory, E I du Pont de Nemours & Co, Inc, on "Tensional Properties of Fibers subjected to Repeated Stresses". *Meeting place:* Ciba Company's Conference Room, 1235 McGill College Ave, Montreal, Que. *Date:* Feb 11, 1955.

• Carbide Lowers Price on 4 Types of Cellosize

A price reduction of 20 cents per pound on Cellosize hydroxyethyl cellulose has been announced by Carbide and Carbon Chemicals Co, a Division of Union Carbide and Carbon Corp. The products involved, all low salt content powders, are designated Cellosize hydroxyethyl cellulose WP-09, WP-3, WP-40, and WP-300.

• Mona Establishes Southern Branch Office

Mona Industries, Inc, Paterson 4, N J, has opened a branch office and warehouse in Greenville, S C, which will operate under the name "Mona Southern, Division of Mona Industries, Inc".

M M Long will be in charge as manager, supported by the following representatives: *Virginia and North Carolina*—Ralph Gossett & Co, 8 So Church St, Greenville, S C; *South Carolina*—R W Bailey, P O Box 1853, Greenville, S C; *Georgia, Alabama and Tennessee*—Charles G Stover Co, P O Box 6, West Point, Ga.

• HRL Celebrates 10th Anniversary

December 1954 marked the tenth anniversary of Harris Research Laboratories, a Washington, D C, chemical research laboratory headed by Milton Harris. The occasion was recently celebrated by all the members of the organization in festivities which included presentation of awards to members of the original group.

Harris Research Laboratories was started by Dr Harris in December 1945, his original staff consisting primarily of a group of twelve chemists and technologists who had worked with him at the National Bureau of Standards under the sponsorship of the Textile Foundation. During the war, Harris Research Laboratories worked on a number of projects for the Army which contributed to the development of improved shrink-resistant clothing, water repellent clothing, protective clothing, and tentage for the armed forces.

Today, the staff of Harris Research Laboratories has grown to include some 40 technical persons, including seven of the starting group of 12. There has been a corresponding growth of scope and size of the projects on which the laboratory works, but it is interesting that five of the original projects are still being continued. The projects of the past ten years have encompassed a variety of fiber, detergency, cosmetic and general textile studies. In the field of textiles, the following range of subjects is representative: the luster or gloss of cotton, development of industrial felts, synthetic fur ruffs for use in the Arctic, development of various finishes to enhance the virtues of different fabrics, and study of warmth and coolness of clothing in different climates.

In addition to work sponsored by outside agencies, Harris Research Laboratories supports a number of its own activities. Notable among these have been studies on the fundamental and applied aspects of wool chemistry. These studies have been continued during the past decade, and have brought forth three developments of considerable industrial importance. One of these is the Harriset process, a means of producing shrinkage resistance in wool by controlled chlorination. The second process, known as Harristrip, is a process for stripping the dye from re-used or re-processed wool without damage to the fiber. The third achievement, which is not as yet designated by a special trade name, is a method for bleaching the natural pigments in dark animal fibers more effectively, and with less injury to the fiber, than any other method now available. The laboratory licenses these methods to fiber processors in this country, and in Europe, Africa, and South America.

The Laboratories also support research conducted by the Textile Research Institute (of which Dr Harris is a member of the Board of Trustees) and the American Association of Textile Chemists & Colorists.

• CCNY Textile Center Moves to New Quarters

The new Textile Center set up last Fall at CCNY will hold Spring term classes at The City College Baruch School of Business, 17 Lexington Avenue, New York, (formerly held at the Textile Center, 351 West 18 Street).

The schedule of Spring courses to be offered includes Elementary and Advanced Textiles; Textile Converting; Cotton; Rayon and Synthetics; Basic and Advanced Design and Weaving; Textile Merchandising and Promotion; and Textile Testing and Fabric Analysis.

Two courses which have been added to the Textile Program include Essentials of Salesmanship, which stresses development of the salesman's personality as well as all techniques of selling, and Basic Chemistry for the Businessman—a new course developed for executives in textiles, manufacturing, investment, and related fields where a basic understanding of chemistry and the principles of the new field of atomic energy are needed.

Allied courses to be offered in conjunction with the textile program include classes in Human Relations, Speech Improvement, Production Control, Commercial Financing and Factoring, and Controls for Marketing.

The Spring term starts on February 7. Free career information service and registration will take place on February 2, 3, 4, from 6:00 to 8:00 pm.

• FIT Offering New Textile Program

The Evening Division of the Fashion Institute of Technology, New York, N Y, is offering a diversified textile program for people employed in the industry.

The following courses are being offered: Basic Textiles, Textile Testing, Quality Control (of textiles), Textile Design, Textile Merchandising, Fibers and Fabrics, Man-Made and Synthetic Fibers, Fundamentals of Textile Converting, Introduction to the Knitting Industry, Principles of Knitting, Pattern Wheel Designing on Circular Jersey Machines, Circular Jacquard and Interlock Knitting, and Full Fashioned Knitting.

A free counselling service to help in the selection of courses best suited for their particular goal is offered to prospective students. Those interested should call the Office of the Evening Division (ORegon 5-8130) for an appointment.

• New Textile Printing Course at FDC

Fairleigh Dickinson College, Rutherford, N J, will offer in the Spring semester beginning Feb 8th, a new and comprehensive evening course in Textile Fabric Printing. It will be given by Herman Baumann, Technical Service Dept, American Aniline Products, Inc.

Course content will include historical background and the mechanics of all printing methods; the preparation of various fabrics, both mechanically and chemically; print formulations and fixations for classes of dyes on all fibers; full coverage of block, screen and roller printing procedures, as well as special print effects; aftertreatments, such as aging, steaming, etc. A visit to a print plant will be included.

The course carries 3 credits toward a degree. It will be given on Tuesday evenings from 7:55 to 10:30 pm in Rm 23 of the Hesslein Textile Building. Registration is now accepted at the Evening College Office, Castle Building, Rutherford, N J. Phone: Geneva 8-1600.

• Davis & Davis Named MCC Representatives

Midland Chemical Corporation of Dayton, Ohio, has announced the appointment of Davis & Davis, 740 N Rush St, Chicago, Ill, as manufacturer's representatives serving the area on matters dealing with MCC's special vehicles, resins, and Dextran Chemicals.

Davis & Davis will cover the states of Illinois, Wisconsin, Minnesota, and parts of Indiana, Iowa, and Michigan.

• Mendell Using Fluorescent Color on Drums

Edward Mendell Company, New York, is now putting its trademark (Emco dyes) on the head of every drum leaving the warehouses using as the stencil medium a fluorescent color.

In the drug room or dyehouse storage room it is often difficult to distinguish one drum from another. This new method reportedly makes identification easier and quicker.

The contents of each barrel are likewise being indicated by the fluorescent name which appears on the sides of the barrel.

• R&H Announces Price Changes

Rohm & Haas last month announced a price reduction of a cent and a half per pound on Lykopon, its concentrated sodium hydrosulfite, in all quantities. Lykopon is widely used for reducing vat dyes and for color stripping.

On January 1st Rohm & Haas increased the price of Rhonite 610, a resin for crease resistance and stabilized finishes on cotton and rayon, a quarter of a cent a pound.

• ATMA to Meet at Raleigh

The School of Textiles, North Carolina State College, will be host to the American Textile Machinery Association on TEAM Day—Textile Education and Machinery Day—to be held on February 15.

Guests to be invited will include the officers and directors of the Association and top officials of the member firms and the Director of the North Carolina Textile Foundation. Plans for the day include discussion of the educational program and research activities of the School of Textiles, a luncheon, an inspection tour of the textile laboratories of the School, a social hour and banquet, and the N C State-Duke basketball game that will take place that evening. The guests will be housed at Scandia Village, a resort motel north of Raleigh, where the banquet will also be held.

Plans for the program are being made by Mrs Mildred Barnwell Andrews of ATMA and William A Newell of the School of Textiles at North Carolina State College who is chairman of the committee for the occasion. Other committee members at the School of Textiles are E B Grover, G H Dunlap, H A Rutherford, W E Shinn, and B L Whittier.

The American Textile Machinery Association is an organization representing 53 U S firms that produce complete textile-processing units, except for hosiery machinery. Its president is Frederic W Howe, Jr, president of Crompton and Knowles Loom Works.

• Biotronic Laboratories Formed

Biotronic Laboratories of Coventry, Conn, has been formed by John B Rust, former research director of Montclair Research Corp, Montclair, N J, and Shulton Inc, Clifton, N J. The new company manufactures fine chemicals, biochemical reagents, and physical accessories. Among the products now being sold are a variety of high purity tetrazolium salts and sulfhydryl reagents.

The new company also engages in consulting work in the field of high polymers, textile chemicals, agricultural chemicals and radioactive tracer research.

• New Cherokee Plant Almost Completed

Construction on the new two-million dollar cotton spinning, dyeing, and weaving plant for Cherokee Textile Mills of Knoxville, Tenn, is nearing completion. The plant is now completely under roof and the masonry work has been finished.

The plant will provide 220,000 square feet of floor area. Overall dimensions are 343 x 598 feet. The building will be totally enclosed and air conditioned throughout. Except for the dyehouse section which includes a basement, it will be a single-floor structure. The dyehouse basement will house the boiler room, dyehouse pumps, water softening facilities, and chemical equipment.

OBITUARY

ARTHUR CLAYTON

ARTHUR CLAYTON, technical director of the Peerless Color Company, Inc, Plainfield, N J, died on December 8, 1954 after a long illness.

Dr Clayton was born in England in 1878, was graduated from the University of London and worked for L B Holliday in Huddersfield, England, before coming to this country. He later became head of chemical research with Calco Chemical Division, American Cyanamid Co, where he remained until about 1930, at which time he became a partner of the late Dr R W Cornelison in the Peerless Color Company.

He is survived by a sister, a daughter, a son and two grandchildren.

LESTER F HOYT

LESTER F HOYT, a chemist with National Aniline Division, Allied Chemical & Dye Corp for 17 years, died recently at Buffalo General Hospital. He had been in failing health for a year.

Mr Hoyt was born in Springfield, Mass, and was graduated from MIT in 1913. He went to Buffalo in 1914 and worked for the Larkin Co as research director and chemist until 1937 when he joined National Aniline in the detergent application research division.

Mr Hoyt was a charter member of the Torch Club and the American Oil Chemists' Assn. He also was a member of the AIC, ASTM, and ACS (Western New York Section).

Surviving are his widow and three daughters.

NAMES IN THE NEWS

SAMUEL LENHER, assistant general manager of the Organic Chemicals Department, E I du Pont de Nemours and Co, Inc, was elected president of the Synthetic Organic Chemical Manufacturers Association at that association's thirty-third annual meeting, held last month at the Hotel Commodore in New York.

Also elected at the annual meeting of SOCMA were R WOLCOTT HOOKER, Hooker Electrochemical Co, first vice-president; J H HILLDRING, General Aniline and Film Corp, second vice-president; J R FISHER, Gamma Chemical Corp, treasurer; A E CLEGHORN, National Aniline Div, Allied Chemical and Dye Corp, member of the board of governors, Class of 1957; and A T LOEFFLER, Food Machinery and Chemical Corp, member of the board of governors, Class of 1957.

AUGUST MERZ, American Cyanamid Co and ELVIN H KILLHEFFER, both past presidents of SOCMA, were reelected honorary members of the board of governors.

The eighth president of SOCMA, Mr Lenher joined the Du Pont Company in 1929 as a chemist at the Wilmington Experimental Station and during his career has held positions as research chemist, technical advisor to the Fine Chemicals Division, and superintendent of the development group at the Chambers Works, Deepwater Point, New Jersey. He became Chambers Works manager in 1944, and the next year, manager. In 1946 he was transferred to Wilmington headquarters as director of manufacture for the Dyestuffs Division and in June, 1950, assumed his present position.

The retirement of S C KELTON, secretary of the Rohm & Haas Company, has been announced. Mr Kelton joined the firm in 1916 after graduation from the Harvard University Law School and has served as secretary and director since its incorporation in 1917. He has also handled important sales, administrative and legal responsibilities. Mr Kelton will continue to serve as a director of the Company.

F J RARIG has been elected acting secretary. He has been actively engaged in the work of the secretary's office for the past seven years and was elected assistant secretary on October 24, 1950.

EDNA TURNBULL of the Boston Office of Stein, Hall & Co, Inc, has retired after more than 46 years of service. A testimonial dinner party was given in her honor last month by her associates in the Boston and Providence Offices.

Philadelphia Quartz Company, Philadelphia, has appointed WALTER L SCHLEYER to its Chemical Department staff. He was formerly research associate at Columbia University, College of Physicians & Surgeons. Dr Schleyer will be assigned to technical service work.

Field

Brainerd

Flett

Rankin

Brewer

JOHN A FIELD has been appointed vice president of Carbide and Carbon Chemicals Co, a Division of Union Carbide and Carbon Corp. In his new capacity, Mr Field will be responsible for sales development and related activities, including the Company's fellowships at Mellon Institute.

Mr Field has just returned to the Company after a six-month leave of absence to act as assistant administrator of the Business and Defense Services Administration, U S Dept of Commerce. Prior to his Washington assignment, he had been assistant manager of Carbide's Fine Chemicals Department.

R L BATEMAN, former manager of the Fine Chemicals Division, has been named to the newly created position of director of product development, where he will work with Mr Field. W A WOODCOCK succeeds Dr Bateman to the Fine Chemicals Division managerial post. He and R H WELLMAN, newly appointed manager of the Agricultural Chemicals Division, will assist Dr Bateman in developing markets for Carbide's newer products.

Carbide has also announced the appointment of H E KLEIN as district manager of the Kansas City District. He moves up from the assistant managership.

Within Carbide's plant organization, the following promotions have been announced:

South Charleston, W Va—ROLAND D GLENN has been appointed general superintendent to succeed K H ROWLAND, who has been transferred to New York as assistant works manager; FREDERICK H BELDEN has been appointed superintendent in charge of gaseous raw materials, gas production, utilities, and office; and ARTHUR P MOSS has been appointed superintendent in charge of resins and chemicals.

Torrance, Calif—C N RUCKER has been appointed plant superintendent.

Institute, W Va—HENRY B COONS and L N DICKINSON have been appointed assistant superintendents in charge of chemicals production.

Texas City, Texas—R C HIERONYMUS has been appointed assistant superintendent in charge of all gas production and related units.

The retirement of ARTHUR T BRAINERD, manager of the Chicago office since 1927, has been announced by Ciba Co, Inc.

Born at Pemaquid, Maine, in 1888, Mr Brainerd matriculated at Lowell Textile School, and in 1909 entered the dyestuff industry, joining the New York laboratory of H A Metz & Co, Inc. Within a year thereafter he was transferred to Chicago as a salesman, becoming manager of the Metz Chicago office in 1916. When the organization of General Dyestuff was completed in 1926, he remained with them until April, 1927, at which time he joined Ciba.

Mr Brainerd has been very active in the affairs of AATCC. A charter member of the Mid-West Section, he has served it as treasurer, vice chairman, chairman, and councilor. He has served the Association nationally as vice president (Western Region) during 1952 and 1953.

Highlighting recent personnel news from National Aniline Division, Allied Chemical & Dye Corporation, are the following items:

LAWRENCE H FLETT has retired for reasons of health after 35 years service with the Division. He will continue to serve National as a consultant. For the past 12 years he has been director of National's New Products Division and prior to that served in various capacities in research and operations. He has made many notable contributions in the chemical field, and the great development of synthetic detergents in the U S is largely based on work which he pioneered. Mr Flett holds about 75 patents in the field of chemistry. He is the author of a large number of publications and co-author of a number of books, the most recent of which is "Maleic Anhydride Derivatives". Mr Flett is a past president of the American Institute of Chemists, and has been active in AATCC and ACS. He was awarded the Schoellkopf Medal in 1942. He was one of the group that re-established the Gordon Research Conferences, and has been an active participant from the start.

* * * *

ROBERT E ELLSWORTH, editor of *Modern Textiles* since 1952, has been named promotion and advertising manager of National's Fiber Sales and Service. Mr Ellsworth is located at 261 Madison Ave, New York, the new offices of the Fiber Sales and Service Division.

* * * *

W HARVEY MAGUIGAN has been named assistant manager of National's Chesterfield Plant at Hopewell, Va. He moves up from the post of superintendent - industrial & public relations at Hopewell. Succeeding Mr Maguigan to the latter post is W O EDWARDS, formerly personnel supervisor.

TRAVIS V RANKIN has been named general sales manager in charge of sales of all Nopco products at Nopco Chemical Company's Pacific Division. He replaces HAROLD A SWANSON, who has become assistant vice president in charge of the Vitamin Division of Nopco.

Formerly district manager for the Central Sales District handling Nopco industrial chemicals, Mr Rankin has been with the Company since 1936. In his new capacity, he will make his headquarters at the Pacific Division's main office in Richmond, Calif.

Taking Mr Rankin's place as Central District sales manager will be WALTER E BREWER, who will also continue in his present capacity as manager of Nopco's Eastern Industrial Sales District. Mr Brewer, who has been with Nopco since 1936, will continue to make his headquarters at Nopco's main offices in Harrison, N J.

JAMES M YOUNG III, chemical engineer, and ROBERT P KEATING, chemist, have joined the process study group of Hooker Electrochemical Co, Niagara Falls, N Y.

Bartholomew

O'Neil

Bousquet

One of the longest terms of service in the history of Chemical Construction Corp came to an end on December 31st with the retirement of F J BARTHOLOMEW. Mr Bartholomew joined the Company in 1919, five years after it was founded. Since 1938 he has served as assistant secretary and sales executive and, in addition, has directed the firm's advertising policies.

THOMAS M O'NEIL has been elected a director and vice president in charge of marketing of Nuodex Products Co, Inc, wholly owned subsidiary of Heyden Chemical Corporation.

Mr O'Neil has been manager of the Chemical Division, Product Development Division and Market Research Division of Masonite Corporation for the past six years. At Nuodex he will be responsible for coordinating the intensified programs of product development, merchandising and sales.

E W BOUSQUET, National Starch Products' Plainfield, N J supervisor of polyvinyl emulsion operations, has been selected as plant superintendent for the new Meredosia, Ill, plant.

American Cyanamid Company's Research Division has announced five appointments to posts in the Basic Research Department. They are: FREDERICK HALVERSON as a section manager; and G WARREN KENNERLY, R F STAMM, W M THOMAS, and V P WYSTRACH as group leaders. The Basic Research Department was formed recently at the Stamford Research Laboratories in Stamford, Conn.

ROBERT H KRIEBLE, formerly manager—engineering of General Electric Company's Chemical Materials Dept, has been named manager of the Chemical Development Department of G E's Chemical and Metallurgical Division.

Dr Krieble succeeds ALPHONSE PECHUKAS, who has been appointed consultant—materials and processes, Engineering Services Division.

Continued growth of the Chemical Division of Celanese Corporation of America has necessitated an expansion of the New York sales department staff under JOHN W STEVENS, general sales manager.

The new position of assistant general sales manager in charge of staff sales functions, has been created for R J WERNER, who has been district sales manager in the Chicago Office. He will be responsible for all staff functions of the sales department, including the supervision of product managers.

All district sales managers will be responsible, as in the past, to ROBERT W KAMPSCHULTE, who is assistant general sales manager in charge of line functions of the sales department.

ROLF BERNEGGER has been named manager of Geigy Chemical Corporation's plant at Cranston, R I, and will continue to act as head of the plant's production department. Dr Bernegger has been with Geigy since 1952. Prior to that time he was chief chemist for Cliffside Dyeing Corp.

DON M JONES, former engineer at the McIntosh, Ala, plant of the Geigy Chemical Co, Inc, replaces S MARCH, recently resigned, as plant engineer at Cranston.

A WEISBERG continues to be in charge of purchasing and office administration.

Award of $1,000 in Interchemical Corporation scholarships to two seniors and two juniors at Lehigh University was announced recently.

Scholarships of $250 each for the current academic year go to ROBERT B RING, Newark, N J, engineering physics senior; JOACHIM SCHULT, a native of Germany now residing in Bethlehem, chemistry senior; DANIEL P CANNON, Allentown, and WALTER J MESSNER, Washington, N J, both juniors majoring in chemical engineering.

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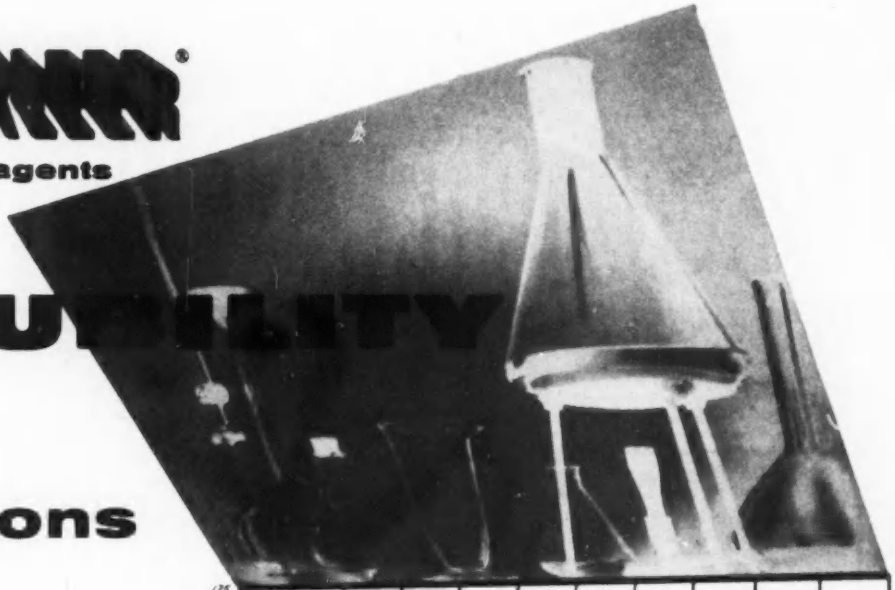

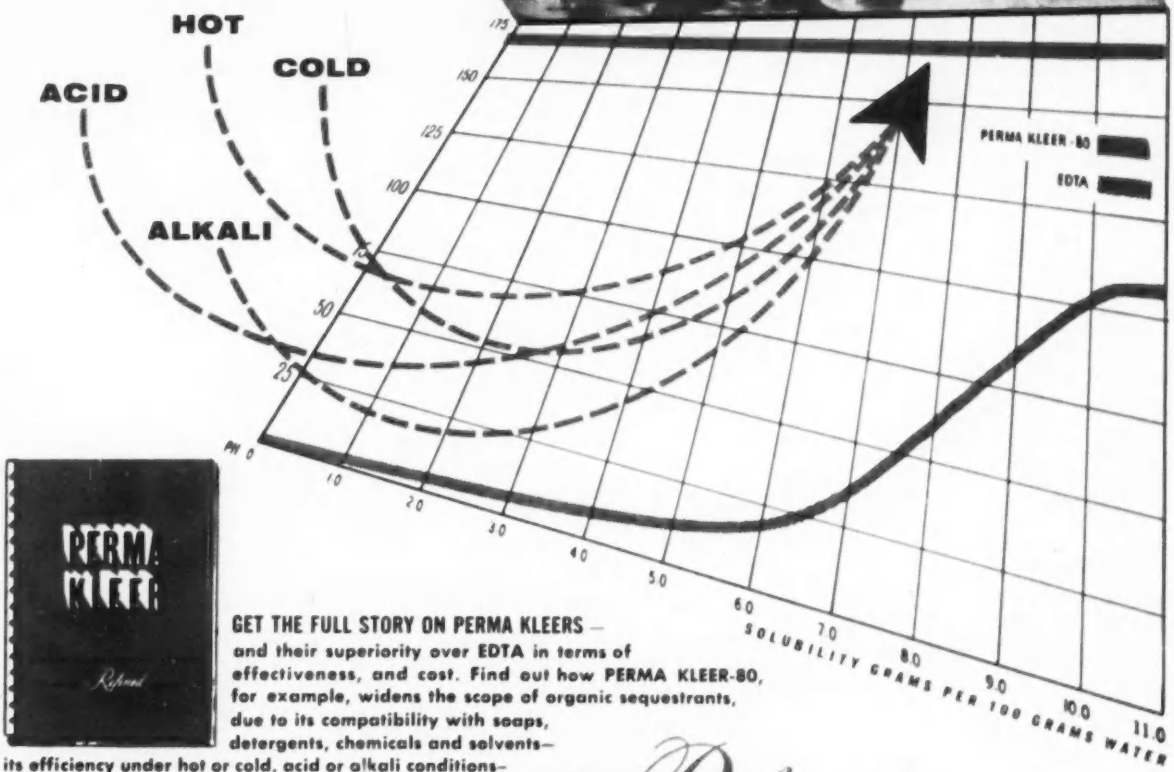

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New York: CARBIC - MOSS CORP., 451-453 Washington St., N. Y. 13, N. Y.
Canadian: RELIABLE CHEMICAL PRODUCTS CO., 85 Cannon St., W., Hamilton, Ontario
Paper Division: STECKER CHEMICAL INC., 162 E. Ridgewood Ave., Ridgewood, New Jersey
European: CHEMITALIA COLORI, Corso Venezia, N. 56, Milano, Italy

INDUSTRIAL DIVISION REPRESENTATIVES

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Midwestern: UEBEL CHEMICAL CO., 410 N. Michigan Ave., Chicago 11, Illinois
Midwestern (Detroit Area): R. A. WILLINGANZ, 205 East Ann St., Ann Arbor, Michigan
Southwestern: RELIANCE CHEMICALS CORP., 2437½ University Blvd., Houston 5, Texas
Salt Lake City: NYLON-KOBURN CHEMICALS INC., 238 W. 3rd South St., Salt Lake City 1, Utah
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Advertisements in this section are restricted to HELP WANTED — POSITIONS WANTED — EQUIPMENT wanted or for sale. Rates, effective February 1, 1954: One-time, $10.00 per column inch; 3 consecutive times (same copy), $9.00 per column inch; 13 or more times, $8.00 per column inch; Position Wanted, $2.00 per column inch. Figure 35 average words per column inch. Publisher reserves the right to reject or discontinue any classified advertisement. Replies should be addressed: Box Number . ., c/o American Dyestuff Reporter, 44 East 23rd Street, New York 10, N. Y.

ABSTRACTING SERVICE—Abstracting and digesting of foreign patents and periodicals. Literature review and special reports in dyestuff and cellulose chemistry. PAUL WENGRAF, 88-36 ELMHURST AVENUE, ELMHURST 73, NEW YORK.

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POSITION WANTED: Textile chemist, age 31, experienced dyeing and finishing plant and development of textile chemicals. Desires opportunity in sales or development work. Write Box No. 823.

POSITION WANTED: Textile Chemist and Dyer. Extensive finishing and laboratory experience. Seeks connection in process development, technical representation, or highly responsible supervisory position in dyeing and finishing plant. Write Box No. 819.

POSITION WANTED: Textile graduate with diversified background in manufacture, testing, and administration. Seeks challenging position; technical sales or service. Presently employed but desirous of more lucrative position. Write Box No. 820.

HOSIERY DYER WANTED: To take charge of large hosiery dyehouse. Excellent opportunity. Replies held confidential. Write Box No. 814.

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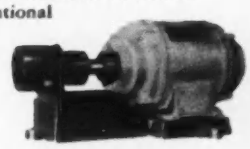

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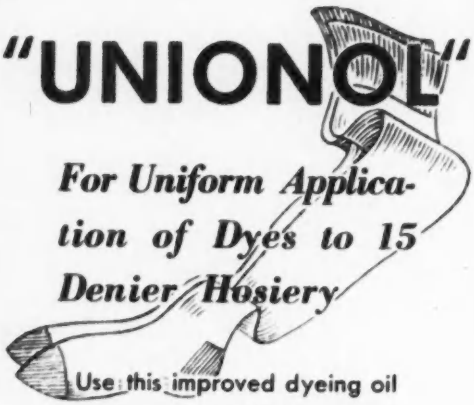

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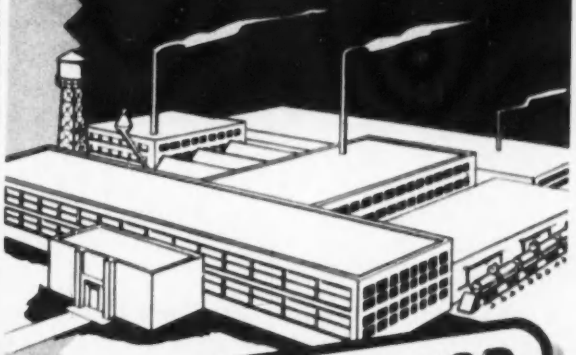

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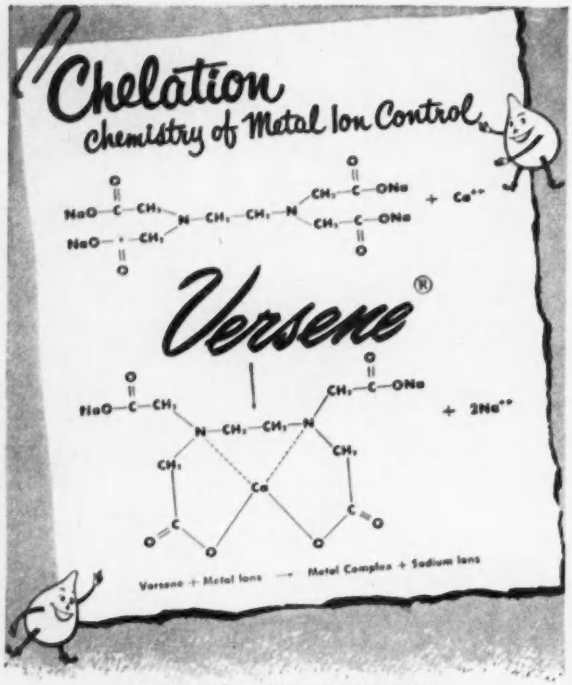

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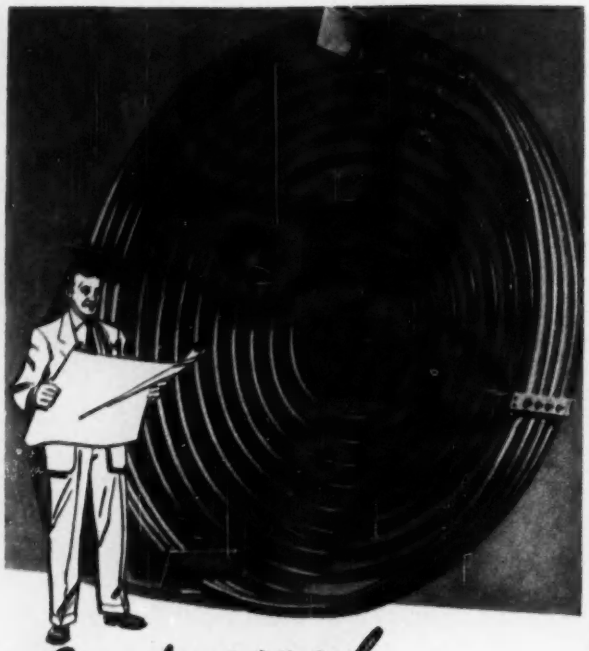

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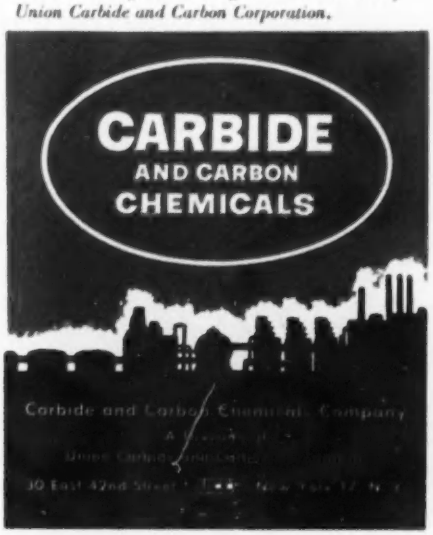

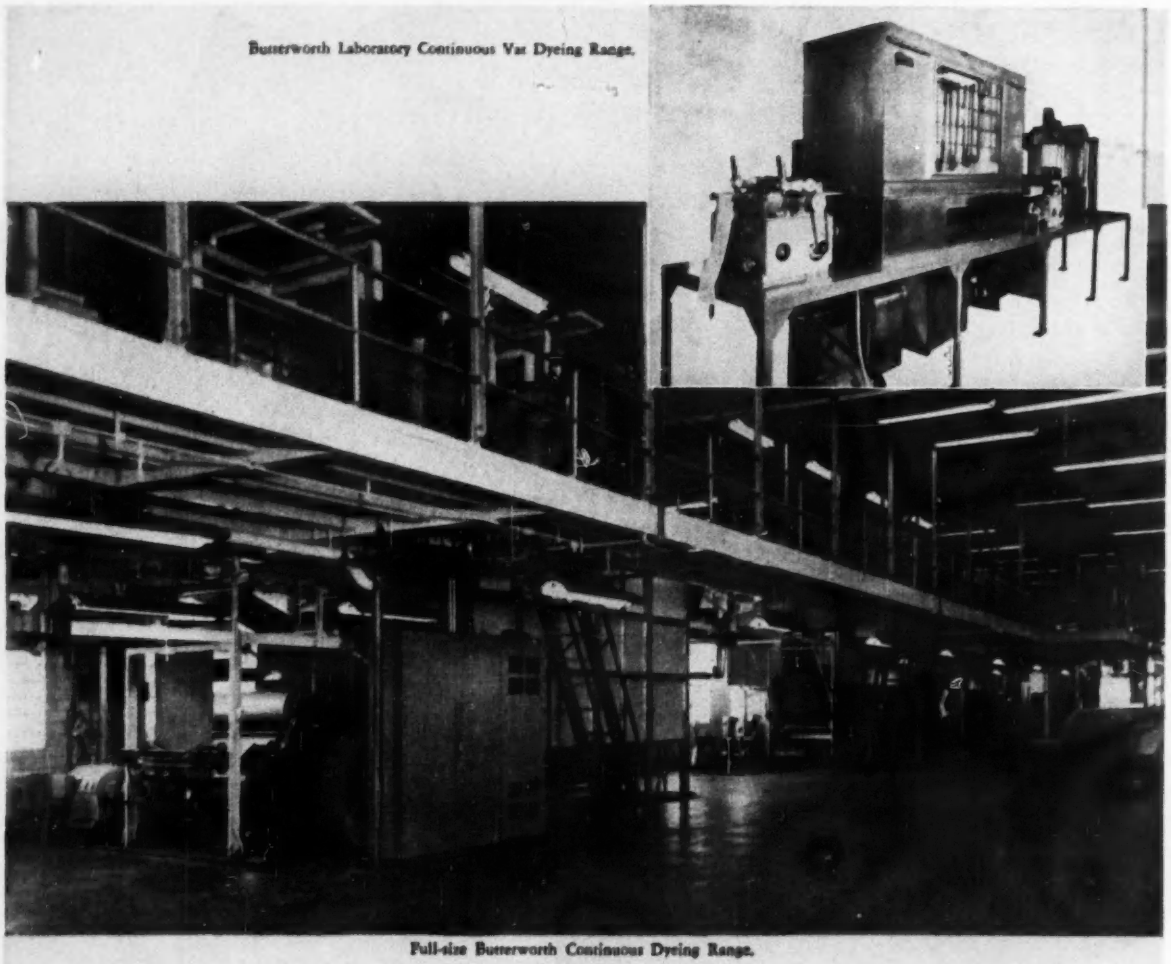

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durable embossing
fire retardance
fixation of starches
flame resistance
gas fading resistance
greater tensile strength
hand: from crisp and resilient to soft and full
improved body
mildew resistance
perspiration resistance
press and pleat retention
reduction of slippage
shrinkage control
soil resistance
spot and stain resistance
stretch and sag resistance
water repellency
whiter whites

PLUS:

easier cutting
improved draping
excellent tailoring qualities
better sewability
freedom from odor

"we've got a million of them!"

Cyana Finishes are economical — efficient — successful for all types of

FABRICS:

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BENGALINE
BROADCLOTH
CHALLIS
CHAMBRAY
CHENILLE
CHINTZ
CORDUROY
CREPE
CRETONNE
DAMASK
DENIM
DIMITY
DRILL
DUVETEEN
FAILLE
FLANNEL
GABARDINE
GINGHAM
GRENADINE
HOPSACKING
JERSEY
KNITS
LACE
LAWN
MADRAS
MARQUISETTE
MELTON
MOHAIR
MOIRE
MUSLIN
ORGANDY
OSNABURG
OXFORD
PERCALE
PIQUE
PLISSE
POPLIN
SAILCLOTH
SATEEN
SATIN
SCRIM
SEERSUCKER
SERGE
SHANTUNG
SUEDE
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TULLE
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TWILL
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There's no end to the profitable combinations of fabrics and functions Cyana finishes offer you. In the last five years we created over 10,000 individual finishes to meet our customers' special needs. Our vast research and manufacturing facilities plus personnel with the training, imagination and will to find the right answer all work together to help solve your specific problem. Working together we may find just the right finish to help sell your merchandise and keep it sold. Call your Cyanamid representative today.

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